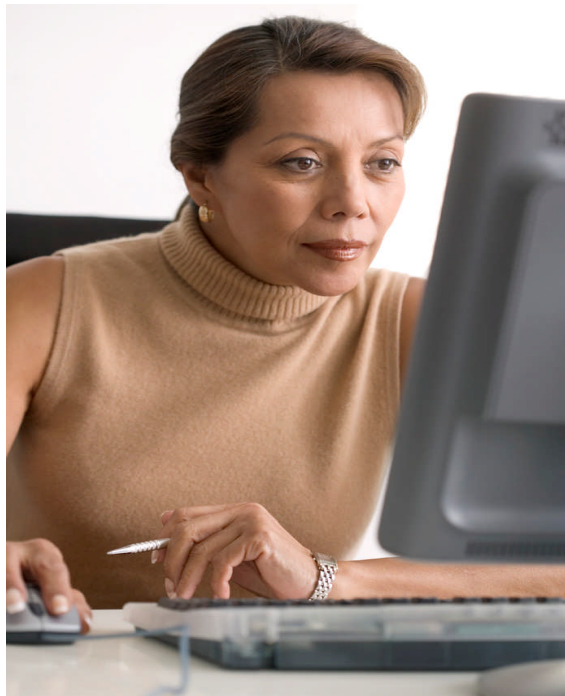# Technology: e-business Tools for Minority Business Enterprises (MBEs)

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Technology: e-business Tools for Minority Business Enterprises (MBEs)

Contents

Introduction

The findings from a 2004 report by the Urban Institute suggest that there is empirical evidence that intensive computer use promotes productivity and profitability among firms of more than minimal size.[1] Although this study concluded that improved awareness and attention to technology would increase levels of performance by these firms, yet it did not suggest approaches to accomplish this objective.

In 2005, in response to the Urban Institute's findings, the US Department of Commerce's Minority of Business Development Agency (MBDA) and Microsoft convened a Technology Partnership for Small Business Task Force (The Task Force) to identify solutions to address the business technology gap among small minority- and women- owned enterprises (MWEs). The output of this effort was a white paper that provided a set of recommendations focusing on capacities and attributes defined as Knowledge, Attitude and Community – the "KNAC" for strategic technology use.[2]

Since the publication of the Task Force white paper, there have been several initiatives undertaken by the MBDA that address the recommendations of the Task Force. These initiatives include the development of a portal (yet to be released), in-market seminars, and developing a platform to provide mentoring and coaching.

The purpose of this report is to provide additional information that would add "value" to a Minority Business Enterprise (MBE) from two perspectives-identification of selected technology and/or information is readily available and useful and factors that could encourage the MBE to improve its performance and productivity through the adoption and increased usage of technology.

Although various constituencies may review this document, this paper is primarily targeted for the minority business enterprise (MBE). An MBE (owner and/or staff) may review *Technology: e-business Tools for Minority Business Enterprises* as a prelude to either adopting or further investing in technology investments for their business.

This report is structured to provide a technology overview of current and emerging technologies commonly used today. Technology change is very rapid – technology manufacturers enter and exit the marketplace frequently. This report will not address all technologies but a subset that are relevant to the MBE community. Specificallly, Infrastructure, Software and Technology Services will be addressed. Please refer to Appendix A – References for a sample list of existing references that may provide up-to-date information listed in the Technology Overview Section.

The Market Analysis section of this paper attempts to provide analysis of the leading vendors of the common technologies covered in the technology overview. This section provides "point-of-time" detail of leading vendors.

The conclusion, Making the Case for Using Technology, provides recommendations on next steps for the IT Industry and additional resources for the MBE's. MBDA supports this initiative and is planning to offer technical assistance workshops geared towards assisting MBEs to access and leverage new technologies.

For the MBE, please use this document as an aide for better understanding and adopting new technology. The MBDA will be supporting the issuance of this document with several activities and products that can further assist the MBE.

You will find a summary of benefits to MBEs in the sections with the **Value to a MBE** heading.

[1] Lerman, et al. *Can Expanding the Use of Computers Improve the Performance of Small Minority and Women-Owned Enterprises?* The Urban Institute, 2004

[2] MBDA, Microsoft et al *Unlocking the Potential of Minority- and Women- Owned Businesses Through Technology*

Technology Overview

Technology can be used differently by disparate organizations. Organizations may also value technology differently. A health-care firm has very different technological needs as compared to a retail-based firm or an MBE in construction services. Each organization may have common solution requirements (software to be used for financial processing) and disparate solution requirements (specific to its field which could include hardware and/or software).

One approach to categorizing the technology taxonomy is how the technology is constructed or used. Viewing technology in this way, technology could be segregated at the highest levels by the categories of Infrastructure (Hardware and Networking), Software and Services. For each of these segments, technologies could be considered Mature or Emerging. Defining Technology as mature would occur if it has been in use for years and most of its faults and inherent problems have been addressed, removed and/or accepted. Thus, emerging technology may have some faults and/or problems that have not been fully removed from its operation. In addition, emerging technology may not have widespread acceptance in the business community. The graphic on the next page depicts several technologies that will be discussed within this document.

The breadth and depth of technology, even within the compendium of the categories of Infrastructure, Software and Services is quite vast. There are companies offering a "better mousetrap" each week. For the purpose of this paper, we are focusing on common technologies that can have the broadest appeal to the majority of MBEs.

Infrastructure

Infrastructure can be defined as a set of interconnected structural elements that provide the framework supporting an entire structure.[3] For the purpose of this paper, we are considering infrastructure the equipment manufactured to deliver technology and/or improve productivity. Subcategories of Infrastructure would focus on Hardware infrastructure – the components used for data access and retrieval and networking infrastructure – the components used to provide data transport across multiple computers. (*The following is not an exhaustive list of technologies, but a subset based upon generally accepted technologies as well as widely viewed emerging technologies*).

Hardware

Mature

The following hardware technologies have matured during the last several decades. Technological improvement has slowed, whereas additional features continue to improve usability and consumer acceptance. Pricing for the following technologies are based upon "price points" – a level of functionality is a given price, what additional functionality/features are and additional price. For example, basic desktop computers can be procured between a price point of $500-$700. Additional features such as additional memory or disk storage or upgraded equipment such as a faster central processing unit (CPU) can increase the price to $1,000-$1,500 and beyond.

Computer Equipment

- Laptops
- Desktops
- Servers

Peripherals

- Printers
- Projectors
- Imaging including Copiers, Cameras, Scanners
- Storage Devices

⌨ **Value to a MBE:**

For the aforementioned technologies, features, price and performance are not the only factors for values to the MBE. Other points of value are service, support and purchasing options.

Additional value that vendors may provide MBEs is procurement alternatives such as leasing or extended-payment options to allow the total cost to be extended beyond an initial payment. Before any other technologies are procured by an MBE, these components are the foundation for the adoption of technology. After procurement, there is a requirement for service and support – initially, the manufacturer may provide operational support, but detailed support will require hiring staff or paying for ad-hoc technical support. Lack of adequate technical support is an inhibiting factor for intensive adoption of technology. A point is reached where the skills become too specialized or the time demands too great to continue with a part-time, unskilled or untrained person. There are several facilities that allow smaller companies to take advantage of purchasing discounts that vendors may provide to larger organizations. One such facility is the Small Business Technology Network (www.smbtn.org). An option for the MBDA is to provide this facility through the use of its portal.

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[3] Defintion - Wikipedia

Emerging Infrastructure Technologies:

The following are examples of hardware technologies that are still evolving and increasing in user adoption. Each are potentially of value to the MBE.

Virtualization

This is a broad term that refers to the "hiding of physical characteristics of computing resources from the way in which other systems, applications, or end users interact with those resources. This includes making a single, physical resource appear as multiple logical resources.   The industry buzz around virtualization is just short of deafening. This "gotta-have-it" capability has fast become "gonna-get-it" technology, as new vendors enter the market, and enterprise software providers weave it into the latest versions of their product lines. The reason: Virtualization continues to demonstrate additional tangible benefits the more it's used, broadening its value to the enterprise at each step. Server consolidation (reducing the number and types of servers) is definitely the sweet spot in this market. Virtualization has become the cornerstone of every enterprise's favorite money-saving initiative. Industry analysts report that between 60 percent and 80 percent of IT departments are pursuing server consolidation projects. It's easy to see why: By reducing the numbers and types of servers that support their business applications, companies are looking at significant cost savings. Less power consumption, both from the servers themselves and the facilities' cooling systems, and fuller use of existing, underutilized computing resources translate into a longer life for the data center and a fatter bottom line. And a smaller server footprint is simpler to manage.[4]

In a recent *InformationWeek* survey, 65 percent of business technology executives said they're already deploying virtualization, and another 24 percent plan to do so. This is one technology movement that's living up to the hype.[5]

⌨ **Value to a MBE:**
- Reduce the cost for investment in hardware
- Reduce quantity of technology required
- Ability to "do more with less"

Infrastructure as a Service[6]

The majority of the IT industry continues to use traditional business models of selling hardware, software and services However, these traditional models are being expanded to embrace a services orientation. For example:

- Hardware manufacturers: in the past sold their products as "boxes;" now using their hardware to deliver a service over a network. Today, SUN Microsystems sells servers and also sells server capacity on its grid. Storage manufacturers could do the same thing.
- Software vendors: in the past sold their products as "shrink wrapped" applications; now using their software to deliver a service over a network. Microsoft and SAP have made significant moves in this area.
- Outsourcing services: typically used an "asset arbitrage" model based on more effective utilization of people and more efficient management of technology; now delivering "business process outsourcing" which is essentially a service model for outsourcing with guaranteed delivery of service transactions such as human resources, accounts payable and help desk.
- Managed Service Providers (MSP) provides delivery and management of network-based services, applications, and equipment to enterprises, residences, or other service providers. Managed service providers can be hosting companies or access providers that offer services that can include fully

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[4] *ABCs of Virtualization* CIO Magazine, 2007

[5] *Down to Business, Buy Sell or Hold These Technology Movements* Information Week March 31, 2007

[6] *The Rise of Service-Oriented IT and the Birth of Infrastructure as a Service,* CIO Magazine March 29, 2007

outsourced network management arrangements, including advanced features like IP telephony, messaging and call center, virtual private network (VPNs), managed firewalls, and monitoring/reporting of network servers. Most of these services can be performed from outside a company's internal network with a special emphasis placed on integration and certification of Internet security for applications and content. MSPs serve as outsourcing agents for companies, especially other service providers like ISPs, that don't have the resources to constantly upgrade or maintain faster and faster computer networks.   In addition to such basic communication service as leased line wide area network (WAN) and frame relay service, an MSP can manage and integrate a range of activities associated with enterprise networks. The range of outsourcing services includes basic transport and access, managed premises, Web hosting, VPN, unified messaging, video networking, or other more sophisticated services. The market for managed services is forecast to grow about 20 percent annually, according to The Yankee Group, due largely to the need for enterprises to be more flexible and timely in getting to market and communicating with customers.

💻 Value to a MBE:

Server Virtualization reduces the cost of deploying more servers at an organization. "Infrastructure as a service" changes the model altogether. In this model, the MBE is renting (or leasing) technology rather than purchasing it. In addition, the day-to-day support of the technology is provided by the vendor rather than the MBE. The core value is a "turn-key" approach to deploying technology and allowing the MBE to do what they do best – fulfilling their mission rather than focusing on the trivial day-to-day issues with supporting the technology. As the MBE considers the investment in technology alternative service and support mechanisms such as the use of a Managed Service Provider may provide additional technology for less initial cost – and providing a support staff when it may be difficult to procure locally.

Mobile Devices

Nearly half of those firms that are using mobile devices to enable on-demand work status, tracking, transaction, and communication are retaining 85 percent or more of their customers, according to the recently published Field Service Optimization Benchmark Report. By contrast, only one-quarter of firms that rely on spreadsheets for these processes are seeing this level of customer retention.[7]

💻 Value to a MBE:

As an emerging technology, this is hardware that is beginning to take root in specific industries such as health care, transportation and professional services. With the continued development of these devices and the continued publication of specialized software to support these devices, this is a segment that continues to grow in adoption.

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[7] Aberdeen Group *Field Service Optimization Benchmark Report* and *Mobile Solutions Emerging as Field Services Boom*

Network

Today, computer networks are the core of modern communication. The scope of communication has increased significantly in the past decade and this boom in communications would not have been possible without the progressively advancing computer network.
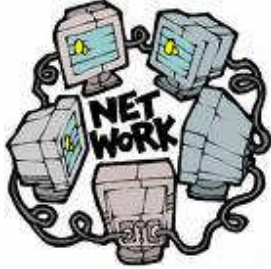
What is a Network?[8]
A network is simply a group of two or more Personal Computers linked together.

What Types of Networks Exist?
Many types of networks exist, but the most common types of networks are Local-Area Networks (LANs), and Wide-Area Networks (WANs). In a LAN, computers are connected together within a "local" area (for example, an office or home). In a WAN, computers are geographically dispersed and are connected via telephone/communication lines, radio waves, or other means of connection.

The Most Common types of WANs:
Internet, The:
A specific internetwork, consisting of a worldwide interconnection of governmental, academic, public, and private networks based upon the Advanced Research Projects Agency Network (ARPANET) developed by ARPA of the U.S. Department of Defense – also home to the World Wide Web (WWW) and referred to as the 'Internet' with a capital 'I' to distinguish it from other generic internetworks.

Intranet:
A network or internetwork that is limited in scope to a single organization or entity or, also, a network or internetwork that is limited in scope to a single organization or entity and which uses the TCP/IP protocol suite, HTTP, file transfer protocol (FTP), and other network protocols and software commonly used on the Internet.

Extranet:
A network or internetwork that is limited in scope to a single organization or entity but which also has limited connections to the networks of one or more other usually, but not necessarily, trusted organizations or entities (e.g., a company's customers may be provided access to some part of its intranet thusly creating an extranet while at the same time the customers may not be considered 'trusted' from a security standpoint).

Types of servers:
Servers are computers that provide services to other computers on a network. The following lists some common types of servers and their purpose.

File server - Stores various types of files and distributes them to other clients on the network.
Print server - Controls and manages one or more printers and accepts print jobs from other network clients, spooling the print jobs, and performing most or all of the other functions that a workstation would perform to accomplish a printing task if the printer were connected directly to the workstation's printer port.

Mail server - Stores, sends, receives, routes, and performs other email related operations for other clients on the network.

Fax server - Stores, sends, receives, routes, and performs other functions necessary for the proper transmission, reception, and distribution of faxes.

Telephony server - Performs telephony related functions such as answering calls automatically, performing the functions of an interactive voice response system, storing and serving voice mail, routing calls between the Public Switched Telephone Network (PSTN) and the network or the Internet (e.g., voice over IP (VoIP) gateway), etc.

[8] Ultimate Guide to Networking, Michael Furdyk, 1999

Proxy server - Performs some type of function on behalf of other clients on the network to increase the performance of certain operations (e.g., prefetching and caching documents or other data that are requested very frequently) or as a security precaution to isolate network clients from external threats.

Application server - Performs the data processing or business logic portion of a client application, accepting instructions for operations to perform from a workstation and serving the results back to the workstation, while the workstation performs the user interface or GUI portion of the processing (i.e., the presentation logic) that is required for the application to work properly.

Web server - Stores HTML documents, images, text files, scripts, and other Web related data (collectively known as content), and distributes this content to other clients on the network on request.

Backup server - Has network backup software installed and has large amounts of hard drive storage or other forms of storage (tape, etc.) available to it to be used for the purpose of ensuring that data loss does not occur in the network.

Bridges and routers are devices used for linking different LANs or LAN segments together. There are many companies that have LANs at various offices across the world. Routers were originally developed to allow connection of remote LANs across a wide area network (WAN). Bridges can also be used for this purpose. By setting up routers or bridges on two different LANs and connecting them together, a user on one LAN can access resources on the other LAN as if they were on the local LAN.
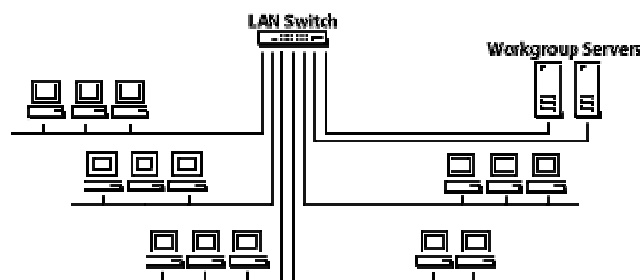
Sample Network Layout With a LAN Switch, Courtesy of Bay Networks

There are maximums on distances between workstations and hubs, hubs and hubs, and stations connected to a single LAN. You can exceed these maximums by linking two LAN segments (groups of users/devices) together using a Bridge or Router.

Type of other mature network equipment:

Bridges
Bridges are simpler and less expensive then routers. Bridges make a simple do/don't decision on which packets to send across two segments they connect. Filtering is done based on the destination address of the packet. If a packet's destination is a station on the same segment where it originated, it is not forwarded. If it is destined for a station on another LAN, it is connected to a different bridge port and forwarded to that port.

Routers
Routers are more complex and more expensive than bridges. They use information within each packet to route it from one LAN to another, and communicate with each other and share information that allows them to determine the best route through a complex network of many LANs.

Switches
Switches are another type of device used to link several LANs and route packets between them. A switch

has multiple ports, each of which can support either a single station or an entire Ethernet or Token Ring LAN. With a different LAN connected to each of the ports, it can switch packets between LANs as needed.

Firewall
A **firewall** is an information technology (IT) security device which is configured to permit, deny or proxy data connections set and configured by the organization's security policy. Firewalls can either be hardware and/or software based.

Value to a MBE:

In conjunction with mature hardware technologies such as desktop PCs and printers, mature network technologies for voice and data are critical to communicate outside of an MBE's office.

As industry moves further ahead with interoperability and ubiquitous communication, there is a significant requirement to adopt these technologies.

For the MBDA or other organizations to advocate adoption of these core technologies, mentoring/coaching is an important activity. Procurement of the technology is a minor activity as compared to the deployment and day-to-day support.

Emerging Network Technologies

IP Telephony – Voice-over-IP (VOIP)

Business voice-over-internet protocol (VoIP) penetration rates are far from being so evenly split between large and small businesses. Today, almost three-fourths of all telephones sold are VoIP. More than 70 percent of large businesses have at least a VoIP pilot deployment. For small businesses, the deployment rate is far less. Telephone service is certainly a need for all businesses, regardless of size. Maybe IP telephony has not yet become a mainstream small-business need. Or maybe no one has convinced them to change their business telephone systems to take advantage of VoIP and unified communications. Small businesses usually buy a phone system when they have a compelling event - when they are formed or when they outgrow their current system or change their location(s) of business. Typically, they look to either their local telephone company or their business systems provider to meet their need.[9]
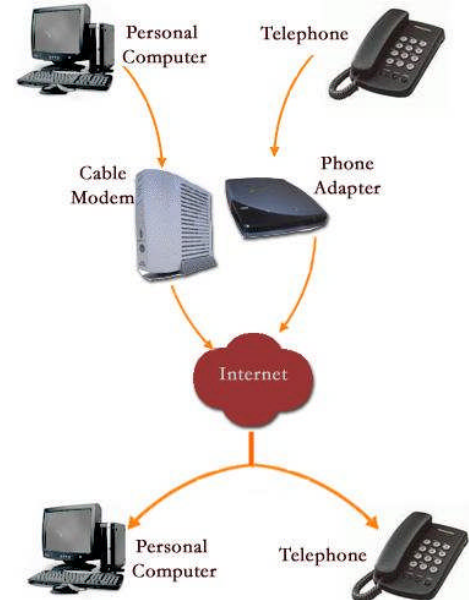
Telephone companies, the traditional channel for small business telephony purchases, mostly have focused on market segments where they are seeing major competition. The consumer markets have seen fierce competition emerging from cable industry or "over-the-top" providers (represented by well-publicized names such as Skype or Vonage). In the large enterprise space, major industry consolidations have raised the levels of competition dramatically. So, the telephone companies have been distracted and have not been aggressively selling IP telephony to small businesses.

The local computer value-added resellers have been attempting to add voice solutions to their data repertoires, being recruited to sell hosted-VoIP services by many regional/local and a few national providers. However, as the IP telephony market now closes in on a decade of maturity, the situation will dramatically change. The balance of 2007, 2008 and through the end of the decade will see the emergence of VoIP solutions across small businesses - and the half of U.S. employees working in firms with less than 500 people will be able to serve their customers and deal with their suppliers as effectively and efficiently as larger businesses, which have already deployed VoIP solutions. [10]

💻 **Value to a MBE:**
- Improved flexibility
- As this matures, cost of ownership is reduced – especially with significant long-distance calling requirements

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[9] Defintion – Wikipedia.org

[10] *Finally VoIP time for SMBs?(voice over ip, small and medium size business,* Telephony March 26, 2007

Hosted Private Branch Exchange (PBX)[11]

PBX , short for private branch exchange, is a private telephone network used within an enterprise. Users of the PBX share a certain number of outside lines for making telephone calls external to the PBX.

Most medium-sized and larger companies use a PBX because it's much less expensive than connecting an external telephone line to every telephone in the organization. In addition, it's easier to call someone within a PBX because the number you need to dial is typically just 3 or 4 digits.

A new variation on the PBX theme is the centrex, which is a PBX with all switching occurring at a local telephone office instead of at the company's premises.

Another feature of the PBX is the ability to purchase fewer telephone lines compared to the number of people requiring phone service. Using a PBX, the organization could order four telephone lines to service six to ten people.

The telecommunications industry will continue to redefine itself in order to address this dramatic service delivery model shift. Recent consolidation trends between phone companies will also continue, with increased focus on the wireless services component. In addition, Cable companies, Internet Service Providers (ISPs), and even desktop application players such as Yahoo, Google, and Microsoft are integrating voice services into their portfolios. After years of hype and speculation, the market for VoIP services now has momentum and is poised to approach and cross the inflection point on the growth curve toward mass adoption.

A Hosted PBX is a service provided organization whereby the company would subscribe for the feature included in a PBX without purchasing the equipment. This typically occurs with VOIP technology.

In the U.S., In-Stat research projects that the Hosted PBX market will experience "explosive growth over the next four years" with revenues reaching approximately $1.3 billion by 2009.[12]   This rapid adoption is aided by residential market leader Vonage, which during 2004 and the first three quarters of 2005 spent $232.4 million to market its VoIP services. While customer acquisition costs make such a level of activity problematic over the long run, Vonage's aggressive activity promotes recognition of VoIP to everyone's advantage.

Other major players now helping to raise awareness include Skype Technologies and a public awareness and education campaign from the Internet Voice Campaign (www.von.org/voip.asp). Additionally, VoIP service roll outs targeting traditional telephone company voice services are underway from AOL and Comcast Corp.

Small and medium enterprises accounted for approximately 73 percent of Hosted IP lines installed in 2004.[13]   In ongoing research of the Small-to-Medium Business (SMB) marketplace, Savatar has found that awareness and interest in VoIP services is high among SMBs, but incumbent providers are not yet responsive, and their sales forces are certainly not well prepared to effectively address the market.[14] As a result, no clear market-leading SMB provider has emerged, and opportunity abounds for Service Providers able to effectively address this market with a compelling VoIP services offering.

Despite their disruptive nature, technology improvements enable the pace of commerce that every business – SMBs included – seeks in order to create competitive advantage and accelerate profit growth. It may therefore seem counter-intuitive that most SMBs are not pre-disposed to procure new telephone

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11 *InFocus: VoIP adoption and the SMB market* – Telephony June 30, 2006

12 *In-Stat, "Steady Growth Ahead for Hosted VoIP Solutions US IP Centrex/Hosted PBX Services", Report* #IN0501848BD, December 2005

13 *Frost & Sullivan, "North American Enterprise IP Telephony End Point Markets", Report* #F696-62, March 2006

14 *Savatar, SMB primary market research,* March 2006

services. Barriers to adoption remain, including perceptions of service reliability, E911 concerns and simple lack of awareness.

Research—as depicted in the chart below—suggests some of the factors that can compel mid-size businesses to undertake the technological leap to VoIP.[15]

Factors Driving VoIP Adoption Among Mid-Size Businesses
(Top Ranking, by % of Respondents)

Source: Frost & Sullivan
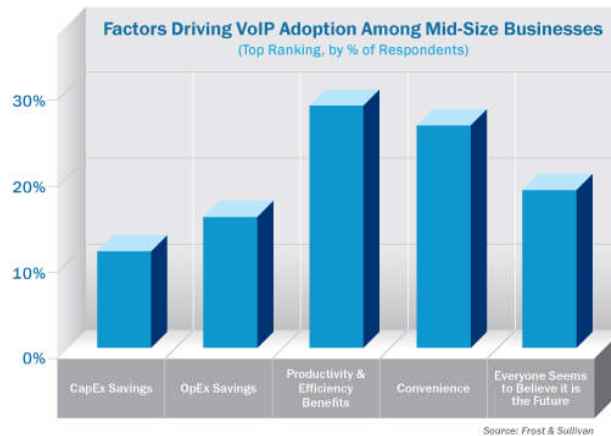
🖥️ **Value to a MBE:**
- With a migration to VOIP, potential for reduced cost of ownership as compared to purchasing equipment
- Better for smaller businesses
- Ease of adding people
- If a company has multiple locations, reduces the cost for purchasing central equipment

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[15] *Frost & Sullivan, "North American Enterprise IP Telephony End Point Markets",* Report #F696-62, March 2006

Trends in Infrastructure / Other Values to MBEs

Additional growth areas in Technology are:

Business Continuity:

Business Continuity Planning is how an organization prepares for future incidents that could jeopardize the organization's core mission and its long-term health. Incidents include local incidents like building fires, regional incidents like earthquakes, or national incidents like pandemic illnesses. Key areas of this are data backup and storage, as well as data archival. At its most basic level, if an MBE maintains data on premises, it should be encouraged to have a backup and archival strategy and process in place in the advent of any disaster. There are various types of business continuity approaches as well as vendors that can provide this technology. For smaller organizations that do not want to invest in hardware, as well as back up media, there are vendors that provide online (or Internet-available) facilities to store and backup data.

Security:

Information security is the process of protecting data from unauthorized access, use, disclosure, destruction, modification, or disruption.[16] The terms information security, computer security and information assurance are frequently used interchangeably. These fields are interrelated and share the common goals of protecting the confidentiality, integrity and availability of information. At its most basic level, if an MBE maintains technology (hardware *and* data) on premises, it should be encouraged to have it secured. There are various types of security (physical, application, data, network) as well as devices (hardware security vs. software security) as well as vendors. With the increased use of the internet as a networking vehicle, viruses are continually introduced to an organization's environment.

The use of data backup and security is critical for the operation of a business. For smaller organizations, this strategy gets lost due to the lack of technology proficiency of the staff involved in managing the information technology. As MBEs become more proficient in the use of technology, the trends of business continuity and security should be advocated as complementary technologies to an organization's infrastructure.

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16 U.S.C § 3542 (b)(1) (2006)

Software

Software manufactured to deliver technology and/or improve productivity.

Operating Systems:

The software marketplace is based upon the operating system installed at the client's location. An operating system (OS) is a set of computer programs that manage the hardware and software resources of a computer. An operating system processes raw system and user input and responds by allocating and managing tasks and internal system resources as a service to users and programs of the system. Software Small-to-Medium businesses have generally maintained Windows-based systems (Server as well as Desktop/Laptop PCs). Another operating system (MAC OS) is specifically geared for Apple-based computing platform. An emerging trend is using Linux which is a free, open-source, operating system. Larger organizations may also procure servers running UNIX or other operating systems.

Productivity Software

Personal Productivity Software allows an individual to perform personal tasks with ease. Certain activities such as writing a memo, creating a graph and creating a presentation are made simpler with Personal Productivity Software. Many popular Personal Productivity Software tools include Open Office, Microsoft Word, Microsoft Excel, Internet Explorer and Quicken.

Enterprise Software

Enterprise Software is software that solves an enterprise problem (rather than a departmental problem). Due to the cost of developing what is often proprietary software, only large organizations attempt to build software that models the entire business enterprise and is the core system of governing the enterprise and the core of business communications within the enterprise.

As many business enterprises have similar departments and systems, enterprise software is often available as a suite of programs that have attached development tools to modify the common programs for the specific enterprise.

Until recently all enterprise software was implemented by a solutions company within the customer's business offices, or within a data center specifically built for that enterprise. However, recently a new model of distribution of enterprise software has begun competing with in-house software. This new model is based on a concept named as on-demand software, or Software as a Service. Essentially the on-demand model is made possible through the widespread distribution of broadband access to the Internet; Software as a Service (discussed below) providers install a series of servers of their own and give a customer company access to the software via the Internet.

Enterprise software is often categorized by the business function that it automates - such as accounting software or sales force automation software. It also varies by industry verticals due to common business processes within a specific industry. There are enterprise systems devised for health care, for example, or for manufacturing enterprises.

Major players in the field include SAP, Microsoft, Altair Engineering, VAI and Oracle Corporation, but there are thousands of competing vendors.

Business Intelligence

Business intelligence tools are a type of application software designed to help the business intelligence (BI) business processes. Specifically they are generally tools that aid in the analysis, and presentation of data. They are valued when analysis performance of the business. Some examples of BI tools are:
- Digital Dashboards - Also known as Business Intelligence Dashboards, Enterprise Dashboards, or Executive Dashboards, these are visually-based summaries of business data that show at-a-glance

understanding of business conditions through metrics and Key Performance Indicators (KPIs). A very popular BI tool that has arisen in the last few years.

- Reporting software generates aggregated views of data to keep the management informed about the state of their business.
- Data mining - extraction of consumer information from a database by utilizing software that can isolate and identify previously unknown patterns or trends in large amounts of data. There are a variety of data mining techniques that reveal different types of patterns.

Antivirus software:

Antivirus software consists of computer programs that attempt to identify, thwart and eliminate computer viruses and other malicious software (malware).

Antivirus software typically uses two different techniques to accomplish this:

- Examining (scanning) files to look for known viruses matching definitions in a virus dictionary
- Identifying suspicious behavior from any computer program which might indicate infection. Such analysis may include data captures, port monitoring and other methods.

Most commercial antivirus software uses both of these approaches, with an emphasis on the virus dictionary approach.

Usually, the term antivirus has also been used for benign computer viruses that spread and combated malicious viruses.

Industry-Specific Software

Whereas enterprise software is software that solves an enterprise problem, industry-specific software is packaged software similar to enterprise software, but it attempts to solve a specific within an industry (or several industries). Manufacturing organizations may need manufacturing and/or design tools like CAD/CAM whereas an organization within the healthcare industry may need a patient management system. Vendors that produce software in all industries is rare, rather they vendors would be specific to an industry.

Trends in Software:

Web 2.0

Web 2.0, a phrase coined by O'Reilly Media refers to a perceived second-generation of Web-based services—such as social networking sites, wikis, communication tools, and folksonomies—that emphasize online collaboration and sharing among users. O'Reilly Media used the phrase as a title for a series of conferences, and it has since become widely adopted.

While interested parties continue to debate the definition of a Web 2.0 application, a Web 2.0 web-site may exhibit some basic characteristics. These might include:

- "Network as platform" — delivering (and allowing users to use) applications entirely through a browser. See also Web operating system. [17]
- Users owning the data on the site and exercising control over that data. [18] [19]
- An architecture of participation and democracy that encourages users to add value to the application as they use it. [20][21] This stands in sharp contrast to hierarchical access control in applications, in which systems categorize users into roles with varying levels of functionality.
- A rich, interactive, user-friendly interface based on Ajax or similar frameworks.
- Some social-networking aspects.

Value to a MBE:
- Improved web presence
- Improved ability to manage and share data
- Improved ability to interact with end-customers

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[17] Tim O'Reilly (2005-09-30). What Is Web 2.0. O'Reilly Network.

18 Dion Hinchcliffe (2006-04-02). The State of Web 2.0. Web Services Journal. Retrieved on 2006 August 6.

[19] Tim O'Reilly (2005-09-30). What Is Web 2.0. O'Reilly Network.

[20] Paul Graham (November 2005). Web 2.0. Retrieved on 2006 August 2.

[21] Tim O'Reilly (2005-09-30). What Is Web 2.0. O'Reilly Network.

Software as a Service (SaaS)

Software as a service (SaaS) is a software application delivery model where a software vendor develops a web-based software application and hosts and operates (either independently or through a third-party) the application for use by its customers over the Internet. The term has become the industry preferred term, generally replacing the earlier terms Application Service Provider (ASP), On-Demand and "Utility computing".
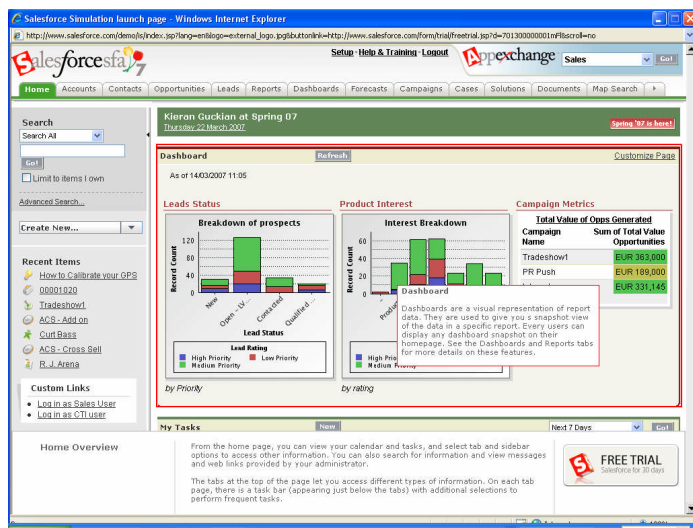
Software as a Service costs up to $135,000 less than a comparable licensed application over three years according to the findings of a Network Computing's TCO analysis[22]. As a term, SaaS is generally associated with business software and is typically thought of as a low-cost way for businesses to obtain the same benefits of commercially licensed, internally operated software without the associated complexity and high initial cost. Consumer-oriented web-native software is generally known as Web 2.0 and not as SaaS. Many types of software are well suited to the SaaS model, where customers may have little interest or capability in software deployment, but do have substantial computing needs. Application areas such as Customer Relations Management, Video Conferencing, Human Resources, Accounting and Email are just a few of the initial markets showing SaaS success. The distinction between SaaS and earlier applications delivered over the Internet is that SaaS solutions were developed specifically to leverage web technologies such as the browser, thereby making them web-native (look and feel of a browser application).

Key characteristics of software delivered by SaaS
The key characteristics of SaaS software, according to IDC, include:
- network-based access to, and management of, commercially available (i.e., not custom) software;
- activities that are managed from central locations rather than at each customer's site, enabling customers to access applications remotely via the Web;
- application delivery that typically is closer to a one-to-many model (single instance, multi-tenant architecture) than to a one-to-one model, including architecture, pricing, partnering, and management characteristics.[23]

SaaS applications are generally priced on a per-user basis, sometimes with a relatively small minimum number of users, and often with additional fees for extra bandwidth and storage. SaaS revenue streams to the vendor are therefore lower initially than traditional software license fees, but are also recurring, and therefore viewed as more predictable, much like maintenance fees for licensed software.

Early SaaS approaches were application service providers (ASPs) who ran a turnkey application on behalf of their clients. But ASPs generally did not build the application themselves; rather, they took an off-the-shelf application (such as a messaging platform, an enterprise requirements planning tool, or a salesforce automation package) and ran it for customers.

SaaS vendors typically utilize a multi-tenant architecture, meaning that multiple customers are running the same software, but with a virtually separate data. ASPs by comparison, merely deployed one application instance on a server for each customer, just as a customer would deploy internally. This inability to scale this kind of business model may be cited as one of the reasons for the failure of the ASP model. It's

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[22] TCO Analysis, Network Computing, March 2007
[23] TCO Analysis, Network Computing, March 2007

reasonable to assume that multi-tenant architecture simplifies application management for the vendor. For the customer, however, this benefit of multi-tenant is meaningless or even negative. In a shared architecture like multi-tenant, one customer (tenant) can excessively burden the service to the disadvantage of the other tenants' performance. For this reason, most SaaS vendors place some physical limits on customer bandwidth use (called "rate limiting") and on the number of times a customer can access the APIs of a service.

⌨ Value to a MBE:
- Reduced cost of ownership
- Ease of deployment
- Flexibility
- Easier to change quantity of users
- Not locked into a long license

Service Oriented Architecture (SOA)

SOA is a design for linking business and computational resources (principally organizations, applications and data) on demand to achieve the desired results for service consumers (which can be end users or other services). OASIS (the Organization for the Advancement of Structured Information Standards) defines SOA as the following:

> *A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations.*

The main drivers for SOA adoption are that it links computational resources and promotes their reuse. Enterprise architects believe that SOA can help businesses respond more quickly and cost-effectively to changing market conditions.[24] This style of architecture promotes reuse at the macro (service) level rather than micro level (objects). It can also simplify interconnection to - and usage of - existing IT (legacy) assets.

It's why only 7 percent of the respondents to a recent *InformationWeek* survey said their SOA implementations exceeded company expectations.[25]

⌨ Value to a MBE:

This is an architecture approach that a business (large or small, MBE or not) would use if they chose to deploy custom-developed applications. Other values to an organization:[26]

- Faster time to market - The core philosophy of SOA inherently promotes reuse for development and integration teams. With reuse of services and components, new applications can be quickly assembled to respond to changing market conditions or business demand. With the shortening of project time frames comes a faster response rate to changing business requirements and less development cost.
- Operational efficiencies - Most packaged enterprise applications perform well in streamlining processes related to standard tasks. However, the performance rapidly deteriorates while automating and streamlining customized processes that encompass multiple enterprise applications. The process is difficult, time-consuming and expensive to implement and maintain. SOA virtually eliminates these complexity barriers. It allows IT to more rapidly change to the needs of the business so that IT can create a culture and an infrastructure of business adaptability. In other words, SOA enables "IT that fits the business."
- Faster, less expensive application integration and integration - Implementing a traditional packaged application integration solution is expensive and complex, often requiring extensive manual coding for deployment purposes. An SOA framework provides native support for runtime deployment of services across the network and it dramatically reduces the overall costs of application integration and deployment by automating these time-consuming processes. It also allows extension of integration across business boundaries.

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[24] Christopher Koch A New Blueprint For The Enterprise, *CIO Magazine*, Mar 1 2005

[25] *Down to Business, Buy Sell or Hold These Technology Movements* Information Week March 31, 2007

[26] *SOA Today, Business Value of SOA* DMReview, 2004

Middleware.

Middleware was an emerging software category in the early 2000s that enabled communication between a company's disparate network of computer systems. For example, some firms use middleware to enable older legacy systems for Web use, especially in the e-commerce arena. In many ways, middleware works as a translator in these situations. As business processes become increasingly Web centric, corporate clients turn to solutions like middleware instead of scrapping systems in which they have made significant investments over the years. Some analysts predicted explosive growth in this category through 2005.

Services

Services can address the installation, configuration and post-installation support of the aforementioned technologies.
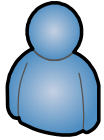
Installation Services

One of the primary causes of system failure during the early stages of the product lifecycle is improper installation and configuration. For small-to-medium MBEs with few, if any, technical support personnel, having technology properly installed is critical.

Installation services may require different personnel to install infrastructure vs. software – having the correct specialist is also vital. These services could be performed by the vendor, or by a local resource, or by a global IT firm.

Technical Support

Technical support (also tech support) is a range of services providing assistance with computer hardware, software, or other electronic or mechanical goods. In general, technical support services attempt to help the user solve specific problems with a product—rather than providing training, customization, or other support services.

Organizations typically employ staff to perform technical support for all technology, but most companies which sell hardware or software offer technical support over the telephone or via various online media such as e-mail or a Web site. Companies and institutions frequently also have internal tech support for employees, students, or other associates. There are also many freely available tech support forums on the Internet, wherein experienced users volunteer to help novices. In addition, some fee-based services, charges for premium technical support services that is accessible 24-hours a day.

Technical support can happen through various media, including e-mail, live chat, telephones, applications (most often, instant messaging), faxes and on-site technicians. The most common is support over the telephone and assistance by remote login into networked equipment such as computer. One of the latest development is the entrance of the Web 2.0 (community based) tech support sites. The community, comprised of both experts and guidance seekers help each other independently.

💻 Value to a MBE:

Through MBDA's advocacy, and improved mentoring/training – coach MBEs as to using the appropriate support.

Application Service Providers / Managed Services (in lieu of owning/managing technology)

The ASP Industry Consortium, the leading trade group for the fledgling industry, defines an ASP broadly as any firm that hosts and manages applications over a wide area network (such as the Internet) for multiple clients.

Most businesspeople seem to understand the concept in more specific terms, according to a survey by the Information Technology Association of America (ITAA), an influential trade organization. The ITAA's study found that two-thirds of respondents defined ASPs as companies that provide "specific business applications on a subscription basis via the Internet or other networked arrangement." The key difference is the assumption that software is leased on a subscription basis, such as through a flat monthly payment, whereas the ASP Industry Consortium doesn't consider pricing structure a defining feature. It's also interesting to note that survey respondents' most common definition assumes ASPs are geared toward businesses, not consumers.

In simplest terms, an ASP consists of a Web site that provides some user-oriented application or function. Familiar consumer applications on the Web include free Web-based e-mail services such as Hotmail and Yahoo! Mail and personal calendar/scheduling applications by the same vendors.

Application hosting for businesses follows a similar approach on a much grander scale and is usually more

lucrative for the ASP. At a minimum, the ASP provides packaged or custom applications through a secured portal. The software in question might be a familiar desktop productivity suite such as Microsoft Office or StarOffice. More often, it might be a high end program tailored to some business process or functional department: order processing, sales force management, accounting and finance, human resources, manufacturing systems, or supply-chain management.

Indeed, some of more popular packages served up by such leaders as USInternetworking, Inc. are the so-called enterprise resource planning (ERP) suites by software developers such as PeopleSoft and Lawson. These multi-application suites, often industry specific, are designed to provide broad, efficient, and powerful functionalities that all organizations of a certain type might need (say, banks or telecommunications companies), but without the costs of developing a set of completely custom applications. Enterprise resource planning (ERP) software grew intensely popular with large corporations in the latter part of the 1990s but also became notorious for being difficult and expensive to implement internally. The ERP deployment process was often slow and disruptive and prone to setbacks due to the complexity of the systems and the ambitious goals set out for them. With the rise of ASPs, ERP has become a leading candidate for outsourcing because, in theory, corporations can leave the implementation and maintenance to the ASP and simply enjoy the benefits of the software.

In addition to merely providing a networked conduit to popular applications, ASPs handle scores of back end system management tasks. In fact, by 2003, ASPs were focusing on this segment of services more than any other. System management tasks range from routine data backups and software upgrades to software customization and hardware maintenance. Often, an ASP commits to a minimum level of service as measured in application availability ("up time") or some other performance gauge. If the ASP fails to deliver as promised, the customer is usually entitled to some type of discount or credit. This guarantee is formalized in a contract frequently called a service-level agreement, a document that both ASPs and customers alike must scrutinize to ensure they're not leaving themselves open to tremendous liabilities or insufficient remedies should problems arise.

While access via public Web space is most commonly associated with ASPs, many also furnish their services over private networks using high speed leased lines or fiber-optic cable. Having a private connection is especially important when the customer has large amounts of mission-critical data flowing into and out of the remote application. The application interface may still be viewed through a Web browser but the communications channel isn't the Web.

🖥 Value to a MBE:
* Alternatives to investing in infrastructure include using alternative services. These services can provide value to a growing organization.

Trends in Services:

Outsourcing

Outsourcing is the practice of hiring an external organization to perform some business functions rather than for the organization to invest in the technology and/or resources to perform those functions. This is a service trend that has significant merit for small-to-medium MBEs.

Enterprises everywhere are scrambling to build an internal infrastructure to support the new business reality: virtual storefronts, Web-based customer services, integrated call centers, electronic supply channels, and shared data across business units. Three new books can help IT managers create and implement technology strategies that best suit their organization.

According to Leveraging the New Infrastructure, 50 percent of all capital spending in the U.S. goes into IT investments. The authors, Peter Weill and Marianne Broadbent, offer a strategy for devising a successful IT investment portfolio.

The key to successful investments is avoiding a hair-trigger technological response and instead following a focused plan that matches infrastructure to the firm's strategic objectives, according to the authors. Using research results and case studies, they analyze different types of IT investments and develop methods for assessing risk and return.

Their conclusions suggest going with the right type of investment to meet company goals. For instance, companies seeking "revenue growth and fast response to market shifts are better served by more infrastructure," while a successful strategy "to maximize short-term profit is to minimize infrastructure investments and focus on transactional uses of information technology." The book details a framework for balancing the IT portfolio for risk/return and appraising the investment on a balance sheet.

In today's evolving business environment, the enterprise infrastructure is directly tied to a firm's strategic direction. It dictates the way in which a company does business and how quickly the company can respond to competitive challenges and customer demands. Given the essential role of infrastructure, the final investment decision belongs not to IT managers but to executives at the very top of the enterprise. Leveraging the New Infrastructure will acclimate these executives to the strategic issues and help articulate a blueprint for a successful IT investment portfolio.

An organization can outsource a business process – such as payroll to an organize such as ADP; or technology process such as application development – or a technology itself - such as telephony, Software as a Service, or Infrastructure as a Service.

Offshore Outsourcing

Offshore outsourcing is the practice of hiring an external organization to perform some business functions in a country other than the one where the product or service will be sold or consumed.

Research firm IDC predicts that by 2007, 23 percent of spending related to IT services will be tied to foreign providers. And Forrester Research issued a report late last year forecasting that by 2015, 3.3 million jobs would move offshore, led by IT services. Consider that India's IT services market posted a 56 percent compound annual growth rate between 1997 and 2002 and will likely expand 22 percent for last year, according to the National Association of Software and Service Companies, an industry association in India.[27]

For an MBE to derive value, the organization would need to offshore outsource any application development – or to a lesser extent, offshore outsource Infrastructure and/or Software as a Service. Whereas the choice of outsourcing (vs. insourcing) is viewed as a business decision, there are many proponents as well as opponents to the practice of offshore outsourcing.

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[27] *Down to Business, Buy Sell or Hold These Technology Movements* Information Week March 31, 2007

Market Analysis

For many of the hardware technologies, there are vendors that produce technologies within several categories. The largest vendors attempt to provide solutions for a company's entire technological needs.

Hardware Vendors[28]

Computers

The PC market consists of the sale, through any retail channel, of both laptop and desktop computer systems. Market values are calculated at retail selling price (RSP) and include all applicable taxes.

This section contains brief overviews of the leading companies in the United States PCs market.

Dell Inc.
Dell is one of the world's largest manufacturers of personal computers engaged in direct-selling model. It designs, develops, manufactures, markets, and services a range of computer systems. The company primarily operates in the Americas; Europe, Middle East and Africa (EMEA); and Asia Pacific-Japan (APJ). It is headquartered in Round Rock, Texas and employs about 65,200 people.

Hewlett-Packard Company
Hewlett-Packard (HP) is engaged in providing personal computers, imaging and printing products, access devices, and consulting and IT infrastructure services to both individual and enterprises customers. The company has a presence in 170 countries across the globe and is headquartered in Palo Alto, California.

Gateway, Inc.
Gateway is among the top ten personal computer (PC) companies in the world and the third largest PC company in the US. The company sells a range of PC-related and non-PC products and services. The company operates primarily in the US, and has international operations in Europe and Asia. Gateway is headquartered in Irvine, California and employs about 1900 people.

Apple Computer, Inc.
Apple Computer designs, manufactures and markets personal computers and related software, services, peripherals, and networking solutions. The company also designs, develops, and markets portable digital music players along with related accessories and services, including the online distribution of third-party music, audio books, music videos, short films, and television shows. The company primarily operates in the Americas, Europe and Japan. It is headquartered in Cupertino, California and employs about 14,800 people.

Computer Peripherals[29]

Computer peripherals suffered overall declines in the early 2000s, along with the rest of the computer industry. Overall shipment values fell from $12.9 billion in 1999 to $10.6 billion in 2001. The decline in value is due primarily to an ongoing drop in prices that continues to sweep through the industry. Historically, competition in the markets for mainstream or lower-end technology has been tight. At the same time, leading peripherals manufacturers look to high-end and emerging technologies to provide comfortable profit margins, and if they're lucky, give them market supremacy if the technology becomes mainstream.

Demand for peripheral equipment thrived in the late 1990s as new computer sales remained strong, and as users replaced their older devices. However, by the early 2000s demand waned as the economy weakened and both companies and consumers reduced technology spending. In recent years certain product segments, especially printers, have fared better than others.

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[28] *DataMonitor Industy Market Research*, DataMonitor Research 10/15/2006

[29] Computer Peripheral Equipment, Not Elsewhere Classified." *Encyclopedia of American Industries* . Online Edition. Thomson Gale, 2006.

Two main markets exist for peripherals: (1) devices shipped as part of original equipment manufacturers' (OEM) computer systems and (2) aftermarket upgrades, add-ons, and replacements that are bought separately from computer systems. Some peripherals manufacturers exclusively serve the OEM market, typically providing peripheral equipment on contract to a large computer maker such as Compaq, Dell, or Gateway. OEM contractors often make customized versions of their products for specific customers. Peripheral manufacturers also serve the aftermarket. They can do so through several channels, including wholesalers and distributors, retailers, or direct sales. Some peripheral makers sell only to the aftermarket. This route can be more profitable, but depending on the kind of device, it can also be smaller than the OEM market, as well as more volatile.

Graphic Displays.
The most popular types of graphic displays are traditional cathode-ray tube (CRT) monitors and flat-panel liquid crystal displays (LCDs). Although some displays are built into computer terminals, most are offered as peripheral devices that attach to a computer's video port. A video card interfaces between the monitor and the CPU, allowing compatibility for specific monitors and computer systems.

LCDs are among the fastest growing and most dynamic segments of the graphic display market. Because LCD technology allows for much flatter displays than CRT devices, LCDs originally caught on as monitors for notebook computers. LCDs also tend to weigh less than CRTs, consume less power, and flicker less, potentially reducing eyestrain. Although early versions of LCDs did not function as well as CRTs in terms of resolution, colors, and refresher rates, upgrades in performance in the early 2000s put the LCD on par with its older cousin. Sparked by increased performance and a decrease in price, LCD sales were growing rapidly by the mid-2000s. Originally, most color LCDs sold were passive-matrix displays, also called super-twisted nematic (STN). Active-matrix displays, also called thin-film transistors (TFTs), which provide higher graphic quality, grew quickly in the mid- and late 1990s to become the dominant format.

Input Devices.
Common input devices for personal computers include keyboards, mice, joysticks, touch screens, microphones, and optical scanners. Specialized hardware for commercial applications includes magnetic-ink reading devices, bar-code scanners, and magnetic card readers.

Printers.
The three principal printer types are dot matrix, ink-jet, and laser. Dot-matrix printers were one of the first responses to demands by computer users for an output device that offered more flexibility than impact character printers. Dot-matrix devices dominated the printer market in the early 1990s, accounting for more than 50 percent of unit sales, but offered poor resolution, particularly for graphics. By the mid-1990s the dot-matrix printer was largely being replaced, since it offered smaller profit margins and appealed to consumers less than newer technology. By the mid-2000s, dot-matrix print had become all but extinct in the marketplace.

Ink-jet printers offer much higher resolution and flexibility than dot-matrix technology. Mid-priced ink-jets in the mid-2000s commonly offered resolution of 1,200 x 1,200 dots per inch (dpi) for standard printing and 4,800 x 1,200 dpi for color photo printing.

Laser printers are often seen as providing the highest quality printing short of professional printing machinery, although some of the better ink-jet models increasingly compete with lasers on quality. Laser printers typically offer 1,200 x 1,200 dpi resolution. Laser printers are likewise often faster than ink-jets and usually have a greater paper-handling capacity. They are, however, more expensive than ink-jet printers. Whereas many mid-range ink jet printers retail for under $100, an entry-level black-and-white laser printer sells for between $100 and $200. Color laser machines have gradually made their way onto the market and are becoming an increasingly affordable option, although they have yet to compete in price with ink-jet printers (an entry-level color laser printer retails in the $300 to $500 range).

Multifunction printers, often based on laser technology, emerged in the second half of the 1990s as a popular and viable alternative. These models (which double as fax machines, scanners, or copiers) appeal particularly to small businesses and home workers, who tend to have occasional need for the various functions but don't use them enough to warrant buying separate machines.

Scanners.
Peripheral scanners are used to translate images and text into electronic signals. Able to recognize characters, line art, gray-scale, and color images, scanners use photosensitive arrays that reflect light to digitize printed information. The three types of scanners common in the 2000s were handheld, flatbed, and drum. Drum scanners are not considered peripheral equipment, however, because they are high-end tools used primarily in the printing industry.

Flatbed, or desktop, scanners are the most common form. Using optical character recognition (OCR) technology, these scanners can be used to translate printed pages into a document that could be viewed, searched, and manipulated using a word processor. Particularly for home users, Web developers, and graphic artists, desktop scanners are also frequently used to input and manipulate photographs and other graphic images. Typical flatbed scanners have a resolution of 1,200 to 2,400 dpi, although some models offered levels of 2,400 to 4,800. Despite the proliferation of e-mail, Web-based technology, and digital equipment, scanners have continued to hold value for consumers. Many multifunction printers are also equipped with scanning capabilities.

Handheld scanners are usually priced much lower than flatbeds and are more useful for scanning small graphics. They tend to deliver lower resolution than flatbeds and have limited OCR capability; as a result, handhelds have not sustained a significant share of the market, but nonetheless continue to remain popular within specific niches for their use in commercial and industrial applications such as scanning bar codes.

Industry Leaders

Because of the industry's diverse product segments, many of its estimated 1,000 U.S. companies specialize in a relatively narrow range of technologies, such as printers only or input devices only, although a few larger companies compete across several segments. A number of the top participants, both in the U.S. market and the world market, are based outside the United States--particularly in Asia, and to a lesser extent, in Europe.

In the printer segment, Hewlett-Packard (HP), which held 58 percent of the market in 2003, down from more than 75 percent in previous years, continues to dominate the industry. Other leaders include Seiko Epson, Canon, Lexmark, NEC Corp., and Xerox. Hewlett-Packard has led the U.S. market in most of the mainstream printer categories, especially laser printers, but it faces a stiff challenge from Epson, Canon, and Lexmark in the low-cost ink-jet arena, which already caused HP to lose market share. During the early 2000s, Xerox made a push to increase its market share, but by the mid-2000s had not significantly cut into HP's portion.

Leading display manufacturers include NEC, Sony, Fujitsu, Samsung, IBM, Acer, Mitsubishi, and Viewsonic. A large number of the monitors sold with new computers in the United States are branded under the names of computer makers like Dell and Gateway; many of these are actually produced by other companies, often abroad.

Important names in the comparatively small keyboard and input device market include Key Tronic, NMB Technologies, and Mitsumi Electronics.

Networking

Companies that design and manufacture network access and communication devices, security hardware, routing and switching equipment, and wireless networking products.

This section contains brief overviews of the leading companies in the United States Network market.

Cisco Systems

Cisco Systems continues to dominate the market for equipment used to link networks and power the Internet. The company's bread and butter products are routers and switches; Cisco's switch line includes equipment based on Ethernet, Gigabit Ethernet, and ATM technologies. Other products include remote access servers, IP telephony equipment used to transmit data and voice communications over the same network, optical networking components, and network service and security systems. It sells its products primarily to large enterprises and telecommunications service providers, but it also has products designed for small businesses and consumers.

Cisco Systems Inc. is aiming ever lower with its network gear for small businesses, rolling out a set of products in 2007 to meet growing demand in that segment for unified communications.

The company cut its teeth in the enterprise market, but sees a large and growing opportunity in selling to small and medium-size businesses (SMBs), organizations with fewer than 1,000 employees. Importantly, SMBs are adopting unified communications faster than big businesses, according to Lauren Ventura, senior director of Cisco's Global SMB Group. This set of technologies, designed to integrate voice, e-mail, text messaging and other forms of communication and bring them into productivity applications, is a major area of focus for Cisco.

Cisco is introducing the Cisco Smart Business Communications System, a set of products to help bring those capabilities to SMBs, especially companies with fewer than 20 employees. The debut comes at its annual Cisco Partner Summit in Las Vegas. At its core is the Unified Communications 500 (UC500), a desktop device that combines voice, video, data, wireless LAN and mobility functions. Cisco is also unveiling the CE500, a companion switch for scaling up the UC500, and Wi-Fi access points and a wireless LAN controller. The system will work with all Cisco IP (Internet Protocol) phones.

The platform is designed for third parties to write applications and integrate them with communications functions such as voice calling and instant messaging. For example, when a customer calls, the customer's history with the company could pop up on a PC or a large desk phone display. There are also features for talking while out of the office: Employees can set up their phone system so calls ring on a desk phone, cell phone, home phone and other devices. And if they leave their desks while talking on a wired phone, they can switch the call to a cell phone with a few clicks on the PC, said Eren Hussein, a marketing communications manager for unified communication.

SMBs have been embracing unified communications as they gain high-speed Internet access and have to deal with more mobile employees, said IDC analyst Ray Boggs. It's often easier for them to make the change than larger organizations because they don't have a big investment in legacy equipment or territorial disputes between telecommunications and IT experts, he said.[30]

AVAYA

Avaya used 2005 to tear it up in the VoIP market. Analysts place Avaya neck and neck with Cisco in enterprise telephony market share, with each owning about 25 percent of the worldwide market. Avaya's hybrid PBX approach, joining TDM and VoIP, attracts users who aren't ready to hand over voice entirely to IP. Its emphasis on professional services and support for third-party software development also win kudos.

In June, Avaya shook hands with Research In Motion to bring Wi-Fi VoIP to the loyal BlackBerry user base and expanded its relationship with Juniper Networks to include joint development of convergence products. The ongoing joint development effort between Avaya, Motorola and Proxim to create wireless voice products bore more fruit this year too, in the form of Wi-Fi and cellular roaming technology. In July, it partnered with IBM to integrate VoIP into IBM's instant messaging and conferencing products. In September, it announced a deal with Sprint to develop wired and wireless hosted VoIP services. It also announced a managed service for small- and midsize business (SMB) IP users, in conjunction with XO

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[30] *Cisco Targets SMBs* Network Computing, 4/5/2007

Communications. It backed up its interest in the SMB market in September when it acquired peer-to-peer VoIP product maker Nimcat. Avaya also unveiled the results of its partnership with SAP, announced last spring, in which Avaya's IP telephony technology added alerting, messaging and conferencing to mySAP applications.

The Avaya of today could be a business student's case study for the core competency business model. Its focus on convergence means that it restricts itself to three areas: IP telephony products, contact-center wares and IP-based mobility. As a $4.9 billion company (for fiscal 2005), the 5-year-old Avaya is far smaller than some of its competitors, like the $14 billion Alcatel (as of 2004). But the upside for its users is that Avaya also has only one set of customers to please - the enterprise network executive. [31]

Siemens

The company is Europe's largest electronics and electrical engineering firm and has operations worldwide in the industrial automation and control, information and communications, lighting, medical, power transmission, and transportation sectors. A leading provider of telecom network equipment, Siemens markets carrier-grade gear through a joint venture called Nokia Siemens Networks. The company supplies computer products through a joint venture called Fujitsu Siemens. Its financial services unit offers corporate financing, fund management, insurance, and risk management services. Its US-based holding company is called Siemens Corporation.

Symantec

The company provides a variety of content and network security software for both consumers and businesses, used for functions such as virus protection, intrusion detection, and remote management. Symantec has used the success of its Norton family of consumer security software to fuel a push into products and services for enterprises, including virtual private networks and applications for firewall management. The company continues to bolster its professional services offerings, which include security assessment, consulting, and outsourced security management.

Juniper

The company designs and sells Internet Protocol (IP) routers for private and public access networks. Juniper also designs the application-specific chips (manufactured by IBM and Toshiba) that control its routers. The company outsources other manufacturing to contractors such as Celestica. Other offerings include network traffic management software, virtual private network (VPN) and firewall devices, and support services. Juniper sells directly and through resellers to network service providers, enterprises, government agencies, and schools.

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[31] The Power 15, Network World 11/2005

Software[32]

The computer software market consists of applications software (enterprise, technical and entertainment software aimed at businesses and home users) and systems/database management software.

Please see Appendix C for a ranking of the 500 leading software manufacturers. Below are several industry leaders.

Industry Leaders

Computer Associates International, Inc.

CA (formerly Computer Associates) is a leading provider of information technology (IT) infrastructure management software. The company develops markets, delivers and license software solutions to manage and automate IT infrastructure. The company primarily operates in the US and Europe. It is headquartered in Islandia, New York and employs about 16,000 people.

International Business Machines Corporation

International Business Machines Corporation (IBM) is a leading player engaged in the invention, development and manufacture of information technologies, including computer systems, software, storage systems and microelectronics. The company has operations in the Americas, Europe, Middle East and Africa (EMEA) and Asia Pacific. The company is headquartered in Armonk, New York.

Microsoft Corporation

Microsoft Corporation (Microsoft) develops and markets a range of software, services and solutions for computing devices.

Oracle Corporation

Oracle is the largest enterprise software company, offering solutions such as business-database, middleware, business intelligence, business applications and collaboration. The company operates in more than 145 countries, with US being its primary market. It is headquartered in Redwood City, California.

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[32] *DataMonitor Market Definition*, DataMonitor Research 12/15/2006

Packaged Software

The packaged software industry designs, develops, and publishes computer software programs for retail and wholesale distribution. Though some are marketed for specialized or technical end uses--and some may be distributed electronically rather than in literal packages--these products are known as packaged or off-the-shelf software, in contrast to custom programs written for a specific customer. Important industry products include operating system software, system utilities, and application tools and solutions.[33]

Industry Snapshot

Valued at more than US$200 billion, prepackaged software falls into two main categories: application software and system infrastructure software, which includes operating system software, system utilities, and program compilers.

A major factor influencing the industry has been the market's continuing trend away from large, expensive, non-standardized (closed or proprietary) mainframes to smaller, cheaper, standardized (open) computer systems. In the mainframe arena, much of the software used was custom developed and often took months from initial planning to final implementation. In some cases, the backlog of software development was so great that by the time the software was installed, it was outdated. This differed greatly from smaller open systems, which provided a means for businesses to use prepackaged software. Prepackaged software was cheaper and took less time to implement because it did not need to be created from ground zero, and as a result worldwide prepackaged software sales increased.

Prepackaged software can be divided into **two main categories**: *system infrastructure* software and *application* software.

System software, which manages computer resources and organizes data, can be further divided into **three main areas**: *operating system software*, which controls the operations of a computer; *system utilities*, which manage system resources and data; and *program compilers*, which act as interpreters of programming languages. Operating systems help the various components of a computer--disk drive, a monitor or monitors, and keyboard--work as a unified whole. System utilities, while they can be part of an operating system, enhance and increase the performance of computers and monitor resources (e.g., determining how much memory is in use and how much space remains on a disk drive). Program compilers convert programming languages that are readable to users into a form that a computer can process as instructions.

Application software can be divided into **two types**: *application tools* and *application solutions*. Application tools are software packages that enable access, manipulation, and retrieval of data, and include programming applications that are used to develop other software programs. Application solutions are software packages that perform specific functions, such as word processing and accounting.

As the software industry's market has matured, there has also been a tendency toward standardization, particularly of infrastructure technology. As a result, many vendors have merged in order to gain economies of scale.

Groupware, another offshoot from the proliferation of client/server technology, also grew rapidly. It allowed groups of people to share information and communicate electronically. The clear leader and one of the first entrants in this area was Lotus Development Corporation's Lotus Notes (Lotus was later a

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[33] "Packaged Software." *Encyclopedia of Global Industries*. Online Edition. Thomson Gale, 2007. Reproduced in Business and Company Resource Center. Farmington Hills, Mich.:Gale Group. 2007

subsidiary of IBM). Companies such as Microsoft and Novell have courted this market with Microsoft Exchange and GroupWise, respectively. Even Internet software giant Netscape entered the picture, offering Netscape Communicator (later owned by AOL Time Warner), a Web browser that also acted as an e-mail package and allowed online conferencing. A similar application to facilitate corporate efficiency was enterprise resource planning (ERP) software. ERP software was customized to help companies manage complete business, manufacturing, and communication functions all within one system. Leaders in the industry included SAP AG, Oracle Corporation, Microsoft, and PeopleSoft.

Industry Leaders

Microsoft
The world's largest software company, Microsoft was founded in 1975 by Bill Gates and Paul Allen. The software company got its first major break in 1981, when IBM chose it to supply an operating system (MS-DOS) for IBM's pathbreaking first PC. As IBM's desktop computer became accepted as the industry standard, so did Microsoft's operating system. Microsoft quickly began offering application packages as well and became a major player in the Macintosh software market during the 1980s. Microsoft's Windows graphical interface, which partly emulated the Macintosh interface, became another standard in the IBM-compatible market, lifting the firm's sales to $1 billion by 1990.

Microsoft earned revenues of US$39.7 billion in 2005, up from US$11.35 billion in 1997. Based on market value, it was the top-ranked global company according to *Forbes* in 2005.   Recent product launches include recent Microsoft releases of registered trademark products, the Vista Operating System for Windows and the Office suite of products.

International Business Machines Corporation
The world's second-largest producer of prepackaged software, IBM reported revenues of US$96.3 billion in 2004, up eight percent beyond the previous year. The world's largest provider of global IT services, the company is also a provider of advanced computing systems.

In 1995, IBM purchased Lotus Development Corporation--formerly the seventh-largest software publisher--for US$3.5 billion. Also, IBM began major restructuring efforts. To make it easier for multinational companies to do business with IBM and break down barriers between countries, a plan was implemented that allowed one contract and one discount to cover multinationals wherever they did business. In addition, in an effort to unify its global operations, the company shifted power from managers who oversaw the operations of an entire country, to managers of 14 industry sectors. IBM has continued to expand its software division through the acquisition of key products. By June 2005, it had acquired SRD (identity resolution software developer), Ascential Software (enterprise data integration software), Gluecode Software (open source application infrastructure software), Meiosys (application relocation software), and Isogon (asset management software).

Sun Microsystems
Based in Santa Clara, California, Sun Microsystems is a leading software supplier and manufacturer of network computing systems and Unix-based workstations. With 2005 sales of US$11.0 billion, down slightly from 2003, Sun reported a net loss of US$388 million that year. Revenues outside of the United States accounted for about 57 percent of the company's total, with the United Kingdom, Germany, and Japan providing most of the international sales. Sun Microsystems' single largest customer was the General Electric Company (GE) which accounted for 14 percent of total revenues. The company's software division consisted primarily of the development of enterprise infrastructure software, software desktop systems, developer software, and infrastructure management software, with its Solaris operating system and Java technology being most well known.

Oracle

As the world's largest enterprise software company, Oracle grew stronger in January 2005 when it acquired competitor PeopleSoft for US$10.3 billion after a hard-fought takeover battle. It was the largest merger in the software industry up to that time. As a provider of Information Architecture, Oracle provides databases designed for large-scale computing; application software, including that designed to aid the management of customer relationships, corporate performance, finances, human capital, procurement, projects, and the supply chain; and middleware products. The merger with PeopleSoft boosted the company's total employee count to more than 50,000 and its application customer count to 23,000.

Oracle's strength was in the ability of its product to run across multi-platform computer environments, share data with other software packages, and use structured query language (SQL). SQL is an industry-standard created by IBM that enables access to various databases and provides information about the data by using a common language. The company's principle business activities include the development and marketing of an integrated suite of computer software products used for database management, computer-aided systems engineering, applications development and decision support, as well as for families of software products used for financial, human resource, and manufacturing applications (ERP software). Through its subsidiaries, Oracle markets its products along with related consulting, educational, support, and systems integration services in more than 90 countries.

Computer Associates International Inc

Among the world's largest management software companies, New York-based Computer Associates (changed name to CA) was providing software and services that dealt with storage, security, operations, product lifecycle, and service management. With more than 15,000 employees, CA had operations in more than 100 countries in 2005. Market research firm IDC reported that CA was the world leader in asset management software sales, with a global market share of 12.7 percent. By 2004 revenues had reached almost US$3.3 billion.

SAP AG

Founded in 1972, German software giant SAP AG was the world's third-largest independent software supplier in 2005 and was the largest provider of inter-enterprise software products (those that allow businesses to collaborate). It employed more than 32,000 people in more than 50 countries, who served more than 26,000 customers in more than 120 countries. By 2004, sales were about US$10.2 billion, up more than 31 percent over 2003 figures.

The company produces midrange and high-end applications suites and dominates the global client/server arena. SAP gained dominance in the marketplace by offering software modules for business areas, such as accounting, manufacturing, and human resources that were highly integrated with each other. It gave companies a single solution to tracking business operations, instead of having to combine a hodgepodge of disparate systems. Two of SAP's main product lines were R/2 software for mainframes and R/3 software for client/server systems. SAP was also credited as being one of the founders of enterprise resource planning, known in the information technology industry as ERP, one of the hottest industry trends of the late 1990s. ERP software helps corporate technology professionals automate manufacturing processes, organize accounting books, streamline departments like human resources, and a variety of other functions related to the corporate trend toward reengineering for optimal cost efficiency.

Novell, Inc

Massachusetts-based Novell offered infrastructure software and services in 43 countries in 2005. One of the hardest hit in 2001, Novell began restructuring in 2002 by cutting one-fifth of its workforce. Revenues increased slightly to US$1.19 billion, and net income was positive. Novell's leading product is its Groupwise messaging software.

Consulting Services

Information Technology Consulting Services

For smaller organizations, there may be a requirement to use smaller, local firms – the following are leading firms:[34]

IT services constitute one of the largest, relatively unregulated, and most rapidly changing industries dealing with high technology. As a result, the rigid organization and structure of the early days, when mainframe computer manufacturers dominated the industry, has disintegrated into many different webs of mergers, alliances, and commercial relationships among manufacturers, independent service companies, and customers. The constancy for companies large and small, for manufacturers, retailers, and independent service companies, has been more competition for IT services and increasing demands for service and reliability from customers. Though IT service providers prefer to sign lucrative, comprehensive contracts as sole service providers for their clients, most companies still use multiple vendors to meet IT service needs rather than rely on all-inclusive contracts.

New technology, competition in the industry, and growing demands from customers have led to blurred distinctions among programming, maintenance, and outsourcing services. Large mainframe manufacturers continued to rely on services for a large part of their revenues. IBM created a separate division, IBM Global Services, that provides customers with network services (for all products, IBM or not).

Computer manufacturers are not the only companies heavily involved in IT services. In partnership with Microsoft, Oracle, and Sun Microsystems, the consulting firm Ernst & Young offered an Advanced Development Center and Accelerated Solutions Environment, places where clients could come to the company to plot strategy and acquire resources from software solutions to mainframe hardware. Xerox acquired a systems integration company to support document-management systems sales and a software vendor to support new application management/outsourcing services to be launched in summer of 1998. And Big Six accounting firm Price Waterhouse entered into a merger with Coopers & Lybrand in July of 1998. PriceWaterhouseCoopers, the result, was the largest IT services firm in the world, generating more than US$13 billion in annual revenue and employing more than 160,000 people. PriceWaterhouseCoopers does business in more than 160 countries.

Current Conditions

In the early to mid-2000s, one of the most notable trends in IT was that the drive in technology was being fueled by consumer demand. Traditionally, technological advances were developed and offered by the companies themselves. This created the demand for those products and services, which often were incompatible with competing offerings. In the more technologically advanced and aware world of the new century, however, consumers knew what they wanted and companies were scrambling to offer products and services to meet those desires.

Security issues continued to dominate the industry's projects. Financial companies in particular were looking at ways to improve security of their data, while retailers had similar concerns, particularly as Web-based purchase activity was on the rise, but consumer confidence in the safety of the systems was on the decline.

By late 2003 and early 2004, a more stable economy and market growth in the U.S. supported demand for IT services across industry lines, particularly on a contract basis. Even so, many companies had already moved or were in the process of moving jobs offshore, making the immediate future somewhat uncertain for the labor force. Some industry analysts were concerned about the movement of white collar jobs, following the mass movement of blue collar employment. According to the ITAA, although the obvious negative effect on domestic employment was clear, the offshore movement will still help the economy as a whole due to inherent cost savings. The association took a firm stand against the offshore movement of government sector outsourcing, however. Overall, it was projected that the IT industry would demand more than 500,000 new skilled workers by 2008, with more than half of the positions would be based offshore.

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[34] "Information Technology Services." *Encyclopedia of Global Industries*. Online Edition. Thomson Gale, 2007. Reproduced in Business and Company Resource Center. Farmington Hills, Mich.:Gale Group. 2007.

Gartner had estimated the value of the IT services industry to be US$607.8 billion in 2004, up 6.7 percent from 2003 figures. The world leader in the industry continued to be IBM, which held 7.6 percent of the market. EDS held a 3.4 percent market share, while Fujitsu held 2.8 percent, and Hewlett-Packard, Accenture and CSC each held 2.3 percent.[35]

In 2005, Gartner was predicting that IT outsourcing would grow globally from a level of about US$20 billion in 2004 to about US$50 billion by 2007. Increasing wage costs coupled with increasing competition could mean tighter margins for IT service companies. Further, with the financial services industry being one of the largest users of IT services (spending 8.7 percent of their revenue on IT, according to Gartner), this sector was also expected to grow as it tried to compete in a world of increased consolidation and tighter regulations. India continued to expand its outsourcing capabilities, although China could catch up to it in the next few years due to its rapid economic growth in all industries.

Industry Leaders

International Business Machines Corporation (IBM)

International Business Machines Corp. continues to be the world's largest provider of information technology services as well as computer products in 2004 with US$96.3 billion in revenues. IBM employed more than 369,000 people worldwide that year. IBM Global Services, which accounted for about 48 percent of revenues in 2004, was one of the company's fastest growing divisions, in part because IBM capitalized on its experience as the world's largest computer manufacturer. Before its services division was created, IBM support focused solely on IBM products. In 1995, however, it formed IBM Global Services by restructuring capabilities that had previously been managed by separate groups into an integrated global office. Global Services contained five units, including Integrated Systems Solutions Corp. (ISSC), IBM Global Network, Availability Services, the Consulting Group, and Education and Training. Since its inception, IBM's service area has made profitable outsourcing deals with companies such as Rubbermaid, Kodak, and McDonnell Douglas. In 2005, IBM was continuing to look for growth through acquisitions in companies providing key software and services, as well as those in emerging growth countries, such as China, Russia, India, and Brazil.

Electronic Data Systems Corp (EDS)

Electronic Data Systems, better known as EDS, was the founder of the information technology outsourcing industry, and in 2005 continued to be the largest IT services provider in the United States. Employing 117,000 who worked in 60 countries in 2004, EDS earned revenues of more than US$20.7 billion that year. One of the largest government contractors in the U.S., in the month of June 2005 alone, EDS, as the nation's largest supplier of Medicaid IT services, earned federal contracts of US$102 million as well as a US$48 million contract to provide services to Massachusetts' Medicaid program. The company also owns management consultant giant, A.T. Kearney.

Fujitsu Limited

The world's third-largest IT services provider and the largest such provider in Japan, Tokyo-based Fujitsu earned revenues of about US$44 billion in 2004 of which about 44 percent could be attributed to its software and services division. About 70 percent of these revenues came from Japan, while 13.3 percent were from Europe, 9.8 percent from Australia, and 6.7 percent from North America. The company is also a large supplier of computer hardware. With its origin going back to 1935 as a manufacturing subsidiary of Fuji Electric, the company began producing computers in the 1960s.

Hewlett-Packard Company (HP)

By 2005, Hewlett-Packard (HP) was active in 178 countries serving 1 billion customers. It was ranked number 11 on the *Fortune*500 listing that year. In 2004, the company employed 151,000 people, of which about 65,000 worked in its services division. Although predominantly a hardware and software provider, HP's services division works with its other departments as well as local systems integrators to provide IT

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[35] " Gartner predicts that by 2010, the number of IT staff in the profession will shrink by 15 percent (press release)." 24 May 2005. Available from http://www.gartner.com.

solutions to its customers. Most of its services were for outsourcing. Approximately 17 percent of the company's total revenues of US$79.9 billion in 2004 were attributed to its services division.

Computer Sciences Corporation (CSC)

Providing IT management consulting and planning, as well as systems integration and outsourcing, Computer Sciences Corporation (CSC) earned revenues of US$16 billion for the fiscal year ended March 2005 and employed about 90,000 people.

Accenture

Once the consultancy arm of the former Arthur Andersen group, Accenture split from its parent (prior to the accounting scandal that enveloped Arthur Andersen) as a result of conflicts with its consultants over pay. In 2000, an international arbitrator granted the consulting group independence. Today, little company information can be found to link Accenture to its former parent. A global management consulting, technology services and outsourcing company, Accenture operates more than 100 offices in 48 countries and has more than 100,000 employees. Revenues for 2004 were US$13.67 billion.

Capgemini

As Europe's leading IT services provider, Paris-based Capgemini provides IT consulting focusing on systems architecture, integration and infrastructure. It addition, the company offers an outsourcing service, often managing all of a client's IT resources. In 2005, Capgemini had 59,000 employees in 30 countries. The company has grown through a series of acquisitions, including: Sesa in France in 1987; Hoskyns in the U.K. and United Research in the U.S., both in 1990; Mac Group of the U.S. in 1991; Volmac in the Netherlands and Programator in Scandinavia both in 1992; Gruber Titze in 1993; and Bossard in 1997 in Europe. But its largest acquisition came with the purchase of Ernst & Young Consulting in 2000. For a while the company was known as Cap Gemini Ernst & Young. Revenues in 2004 were approximately US$7.6 billion, of which more than 76 percent came from Europe, 22 percent from North America, and the remainder from the Asia/Pacific region.

Application Service Providers[36]

All ASPs aren't for all companies. While some cast their nets widely during the industry's formative stages, fundamentally there are separate markets for different kinds of applications and a single ASP is unlikely to serve all markets equally well. For instance, there are applications geared toward big businesses and others aimed at small businesses. Large companies typically require much more elaborate functions and the ability to effectively manage tremendous amounts of data--and need deep pockets to pay for it all. Many large corporations could afford to go it alone if they had to, but choose ASPs for the sake of long term efficiency and cost savings. Small businesses by contrast tend to have simpler needs and more limited means. They possibly don't possess or can't afford the expertise needed to effectively manage a slew of different applications and would be satisfied to get reliable access to a few good programs without many bells and whistles.

Thus not all ASPs offer the same applications or levels of service. They likewise differ in the kinds of bundled services they offer, such as connectivity, maintenance, consulting, customized programming, Web site hosting, and the like. ASPs that concentrate on applications hosting are often termed "pure-play" ASPs because subscription applications are their primary line of business.

A similar breed of outsourcing services is known as application maintenance outsourcing providers or application hosts. These firms differ from the common definition of an ASP in that the customer still purchases an ordinary software license from a software vendor, but the application host takes responsibility for running the software and providing remote access. In essence, the application maintenance provider acts as a manager of the client's own software, which is typically run on the provider's hardware.

Still, market segmentation by ASPs remains somewhat blurred as providers get a feel for what market needs are out there and how they can profitably meet those needs. Clearly, there are already some ASPs directed solely at small businesses or larger organizations, and the process of specialization is likely to accelerate once the most capable ASPs begin building a meaningful presence in the market.

Despite its more narrowed focus, or perhaps because of it, the ASP sector remains one of the fastest-growing U.S. markets in the IT services arena. Research firm IDC estimates that ASP spending in the U.S. increased by nearly 50 percent in 2002 and forecasts growth of an additional 42 percent in 2003. Some experts predict that IT service giants such as IBM Global Services, EDS Corp., and Oracle Corp. will begin to offer ASP services themselves, posing increased competition to smaller ASPs.

Current Conditions

The research firm IDC projected that the global market for software as a service would be worth $7.2 billion by 2007, up from $2.3 billion in 2002. According to the TowerGroup, the ASP market was expected to start maturing in 2005. The firm further indicated that the financial sector alone was expected to spend $2.5 billion on hosted solutions by 2006. In North America, spending was projected to reach $1.53 billion in 2006, up from $710 million in 2003.

According to some industry observers, any service that was not among a company's core competencies was an excellent candidate for outsourcing via the ASP model. Examples include the payroll function, as well as logistics and transportation management. However, companies also turned to hosted solutions for customer relationship management and regulatory/corporate compliance.

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[36] "Application Service Providers." *Encyclopedia of Emerging Industries*. Online Edition. Thomson Gale, 2006. Reproduced in Business and Company Resource Center. Farmington Hills, Mich.:Gale Group. 2007

Despite the trend toward software as a service, some industry observers argued that the service-oriented approach was not likely to replace traditional enterprise software, in which companies had made significant investments. Instead, they indicated that hosted services would develop into a solid industry niche.

Industry Leaders

By the mid-2000s many of the technology industry's leading players, including IBM and Microsoft, offered hosted solutions to their clients. However, a number of companies were more strongly focused on the ASP marketplace. These included USInternetworking Inc., Corio Inc., and BlueStar Solutions Inc.

USInternetworking Inc.

During the mid-2000s, USInternetworking Inc. remained a leading player in the ASP market. A market report in 2000 by Internet Research Group ranked USi as the largest U.S. ASP based on market share. According to IRG, USi held a dominant 36 percent of the nascent market by value of active contracts. Software available from USi included packages from Ariba, Microsoft, PeopleSoft, and Siebel. With applications ranging from human resources and finance to professional services management, USi's target market is large companies. USi filed for Chapter 11 bankruptcy protection in 2002. After eliminating $210 million in debt and securing $81.2 million in fresh capital from Bain Capital, USi emerged from bankruptcy as a subsidiary of Bain. The firm then merged with Interpath. In 2003 USi's sales were estimated at $275.6 million, and the company employed 420 workers.

Corio Inc.

In 2002 Corio, Inc. emerged as the largest pure-play ASP in the U.S. after acquiring rival Qwest CyberSolutions LLC. Corio hosts enterprise software packages such as those of SAP, Siebel Systems, and Broadvision, as well as packages for internal process automation and business analysis. As a pure-play ASP, Corio has enjoyed better name recognition than many of its competitors. The company saw its sales grow 13 percent to $56.1 million in 2002. The company continued to experience growth in 2003. That year, sales grew 22.5 percent, reaching $68.7 million. IBM announced that it planned to acquire Corio in early 2005 in a cash deal worth $182 million.

BlueStar Solutions Inc.

Headquartered in Cupertino, California, BlueStar Solutions Inc. was another ASP industry leader during the mid-2000s. With approximately $50 million in operating revenue and 200 employees, Bluestar is a subsidiary of Dallas, Texas-based Affiliated Computer Services Inc. (ACS), a business process and information technology outsourcing provider that earned revenues of $4.1 billion in 2004 and employed 43,000 workers.

Founded in 1995, BlueStar Solutions specializes in offering enterprise application outsourcing services to the likes of ASM America (ASMA); Autodesk Inc.; Ciba Specialty Chemicals; Linde Lift Truck Corp.; National Oilwell; the North Carolina Department of Transportation (NCDOT); the Southeastern Public Service Agency (SPSA); and the Southern California Association of Governments (SCAG). Within the product areas of enterprise resource planning and messaging, Bluestar supported about 110 customers in 2005. These clients in turn represented some 100,000 messaging users and 60,000 ERP seats in 80 countries. Bluestar acquired fellow ASP Agilera in 2003, and was itself acquired by ACS the following year in a $73 million cash deal. ACS intended to turn the company into its Application Managed Services division.

Outsourcing[37]

Outsourcing occurs when companies opt to have an outside party perform a task that was once handled in house. Examples of outsourcing range from manufacturing parts and products to high level professional functions like accounting, computer programming, engineering, and legal work. Outsourcing also extends to back end business processes such as billing and accounts payable, as well as human resource functions like payroll and benefits administration. Outsourcing is a major strategic decision for organizations, because they must balance a loss of direct control over a process or function in exchange for cost savings, which can range from 15 to 40 percent, as well as heightened competitive advantage, the ability to provide more efficient service, and reduced time to market with new products and services.

When companies outsource a function or process to another country, the practice is called "offshoring" when far-away nations such as India are involved or "nearshoring" in the case of geographically closer countries like Mexico. Offshoring is popular because of the tremendous cost savings that can be achieved. For example, some estimates indicate that companies can save anywhere from 20 to 70 percent on labor by offshoring to low cost nations like India, China, and the Philippines.

The practice of offshoring remained at the forefront of the outsourcing industry heading into the late years of the twenty-first century's first decade as economic globalization continued to grow at an unfettered pace. According to *Forbes,* in 2006 the McKinsey Global Institute estimated that offshore employment, including banking and information technology (IT) jobs, would total 1.2 million by 2008. This was double the number of jobs in 2003.

Outsourcing is not a panacea for every corporate challenge or problem. If not executed properly, the results can be negative. As the *Journal of Business Strategy* explained in its March-April 2004 issue, although there are many benefits associated with outsourcing, "many organizations are naive about the commitment and discipline it takes to reap these benefits. Organizations fail to realize the impacts on their people, processes, methods and tools as they proceed down the outsourcing path. This naive attitude results in outsourcing engagements that are too often disastrous rather than fruitful experiences for corporations. For instance, companies have outsourced legacy systems maintenance, application development, and business processes for the last decade and are still struggling to clearly measure cost savings, service levels and customer satisfaction."

While outsourcing service providers are sometimes located in the United States, they increasingly are located in Mexico, South America or overseas, where lower operational costs make them attractive to U.S. firms. In its April 2004 issue, *Fast Company* indicated that according to research firm Gartner Inc., 40 percent of all *Fortune* 500 companies were expected to have outsourced work to other nations by the year's end. By mid-2006, U.S. Firms like Accenture and IBM Global Services, as well as India-based offshoring providers, continued to expand their operations in markets like China and Latin America.

Consultants are another critical component of the outsourcing industry. They provide strategic advice to companies that are considering or actively engaged in outsourcing. For this reason, Infosys--a leading Indian outsourcing services provider specializing in IT (information technology)--formed its own U.S.-based consulting subsidiary in April 2004. The firm was led by a team of business consulting heavyweights, including CEO Stephen Pratt, who in 2003 was dubbed one of the world's top 25 consultants by *Consulting Magazine.*

In addition to Infosys's new firm, many of the business world's older, established consulting players also are involved in the outsourcing game. Ernst & Young LLP was one leading global consultancy that helped

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[37] "Outsourcing" *Encyclopedia of Emerging Industries*. Online Edition. Thomson Gale, 2006. Reproduced in Business and Company Resource Center. Farmington Hills, Mich.:Gale Group. 2007

companies to successfully implement and manage outsourcing initiatives. It accomplished this through its Business Risk Services unit, which helped companies perform risk assessments, engage in strategic planning, manage licensing, improve operational processes, evaluate third party vendors, and more. Ernst & Young worked with organizations to help them outsource specific functional elements or entire processes.

Types of Outsourcing
Generally speaking, outsourcing operates under one of two main models. Business process outsourcing (BPO) involves transferring the management of a function or service from a company's in-house staff to an outside service provider. The application service provider (ASP) model involves companies contracting with an outside firm that already provides a specialized function or service as opposed to transferring an existing function to them. The term application service provider (ASP) is often used to describe software-hosting arrangements but has been used more broadly in the context of outsourcing. Although these are presented as two distinct models for the sake of example, in actuality there is a great deal of variation in how outsourcing arrangements are made. Each situation is different and can vary depending on the nature of the function or service, the companies involved, and numerous other factors.

By the mid-years of the first decade of the twenty-first century, companies had been outsourcing manufacturing work to low cost nations for some time. However, a relatively recent development was the outsourcing of clerical, technical, and service level jobs. Even white-collar professionals like accountants, attorneys, and engineers were being outsourced in growing numbers. This trend was occurring as companies outsourced such "back office" functions as accounts receivable, claims processing, customer analytics, data processing, legal research, payment services, procurement, tax processing, and transaction processing.

In addition to the aforementioned back end processes, companies also were outsourcing various human resource management (HRM) functions during the early years of the twenty-first century's first decade. In some cases, entire HRM departments were being replaced with so-called professional employer organizations (PEOs), which assumed legal responsibility for a company's workers and managed the important details of hiring, compensation, and termination.

Although examples of outsourcing can be found in a large number of industries, by the early years of the first decade of the twenty-first century, this practice was especially prevalent in the information technology (IT), telemarketing/customer service, and health care fields.

The IT industry was garnering widespread attention during the early years of the decade as a growing number of technology jobs were being offshore outsourced, especially in the area of help desk and application development. Research issued by Foote Partners in 2003 estimated that 35 to 45 percent of IT workers in the United States and Canada would be replaced by a combination of part time workers, consultants, independent contractors, and offshore technicians by 2005. Although some claimed this prediction was somewhat aggressive, it was clear that a growing number of IT jobs were moving offshore.

The health care industry also was using outsourcing quite heavily by the mid-years of the twenty-first century's first decade. This especially was true of hospitals and large health care systems. However, with the exception of medical transcription services provided by Indian firms, many functions, including food services and supply chain management, were being outsourced to highly specialized domestic firms that offered greater levels of efficiency.

Industry Leaders

Administaff Inc.
With 2005 sales of $1.2 billion, Houston, Texas-based Administaff Inc. was among the leading professional employer organizations (PEOs) during the mid-years of the twenty-first century's first decade. According to

the company, it managed some 96,000 workers for more than 5,000 small and medium-sized U.S. companies in 2006, serving as an off-site human resources department.

In 2006, via its Personnel Management System, Administaff served clients from more than 40 sales offices and four regional service centers in 21 U.S. markets. Its range of human resources (HR) services included benefits management, employment administration, employer liability management, government compliance, owner support, performance management, recruiting and selection, and training and development.

Infosys Technologies Limited

Infosys was an established leader in the realm of information technology offshoring, with 36,800 employees and revenues of nearly $2.2 billion in 2005. Based in Bangalore, India with U.S. headquarters in Fremont, California, Infosys also served a number of other international markets, including Australia, Belgium, Canada, France, Germany, Hong Kong, Japan, the Netherlands, Singapore, Sweden, Switzerland, the United Kingdom, and the United Arab Emirates. According to Infosys, the company employs a "low-risk Global Delivery Model (GDM) to accelerate schedules with a high degree of time and cost predictability." Its range of IT services include product engineering, consulting, and application development. Infosys serves such industry sectors as aerospace, automotive, energy and utilities, engineering, financial services, health care, life sciences, manufacturing, retail and distribution, technology, telecommunications, and transportation.

TPI

With headquarters in The Woodlands, Texas, TPI has been involved in advising companies about outsourcing since 1989. According to the company, it helps "corporations throughout the Americas, Europe and Asia Pacific make informed, lasting and substantial improvements in their performance through the use of sourcing." To accomplish this, TPI said it relied on 300 employees, including 180 experienced "global sourcing advisors" who played an active role in the evaluation, negotiation, and implementation of outsourcing initiatives, be they onshore, near shore, or offshore.

Owens & Minor Inc.

With roots stretching back to 1882, Mechanicsville, Virginia-based Owens & Minor got its start as a wholesale drug company. It began distributing medical and surgical supplies on an exclusive basis in 1992, and by 2005 recorded sales of $4.8 billion on the strength of 3,392 employees. Although Owens & Minor distributes supplies to some 4,000 U.S. health care providers, it also provides inventory management and logistics services for hospitals via its OMSolutions offering. This allows hospitals to outsource key staff or even entire materials management departments, enabling them to achieve cost savings through greater efficiency.

Making the Case for Using Technology

Technologies are discussed throughout this document – some are mature and can provide significant value to MBEs, some are emerging and can also provide significant value to MBEs.

Several of the technologies that have been discussed have a basic approach to reducing the cost of ownership to the business. This can be applied to Software as a Service (SaaS), Infrastructure as a Service, Virtualization as well as using an ASP. These service trends in technology are emerging to enable the MBE to reduce its cost of ownership and deployment of technology throughout the enterprise.

If an MBE chooses to use technology in a traditional manner, technology itself may be easier to use, but with complexities in security and networking, may require additional technical expertise than an organization may want to provide. In general, there will be barriers to increased adoption of technology. Further advocacy of technology by the MBDA can improve the adoption methods. Further recommendations, and how the MBE could use technology:

- *Build a technology toolkit for MBEs.*
The task force believed that MBEs will be well-served by a comprehensive technology toolkit that includes a self-assessment tool, guidance that businesses can use to help build a technology infrastructure that can grow with their business, training on the effective use of computers and technology, and other resources. This toolkit would still be effective today. There are a vast array of technological options for MBEs, a toolkit can reduce the time for decision and possibly reduce the complexity.

Throughout this paper, we've seen technology choices regarding investing in technology, or using technology as a service – providing an assessment tool that can help educate the MBE may increase further adoption.

- *Implement a public awareness campaign on the technology MBEs can use today to become more productive and profitable.*
Many MBEs are already aware of technology and may be applying it to their businesses, but greater public awareness of the benefits could encourage MBEs to use technology *more* and to use it more *strategically*. They need targeted advice that is tailored to their industry, and a strong call to action to "wake up" to the benefits of technology and the potential of the global marketplace.

For the MBE, there are a variety of training capabilities for the use of technology. Vendors such as Microsoft, Dell, and Cisco as well as others have seminars and training curricula on their technology and how it could be of use to them. The MBDA is working to consolidate and/or condense this information and develop effective communication vehicles so that it could better target the MBE audience.

- *Define clear and actionable value propositions for the use of technology among MBEs.*
Identify ways to explain the benefits of adopting technology best practices in a way that creates mutually beneficial opportunities and serve the needs of a diverse range of businesses. In other words, "sell" them on the benefits of technology to create pro-technology attitudes among owners of MBEs. This paper attempts to explain the benefits of technology – with an adoption of a toolkit and an appropriate technology awareness campaign to assist the MBE to adopt additional technology:
    1. Use of email
    2. Improved use of website (when needed)
    3. Buying vs. leasing vs. infrastructure as a service
    4. Deployment of software – either by the MBE or use as a service
    5. Assistance in the identification of the appropriate firm (or hiring of appropriate people) for installation services and/or support

- *Establish a technology coaching and mentoring program.*
There are several sites of professionls that focus on Small and Medium Businesses (SMB) for example, www.smbnation.com . Although many MBEs are also SMBs, the MBE does have unique characteristics. This is recognized by the MBDA and the TaskForce which are endevoring to create a system of coaches and mentors who personally nurture technology adoption, building partnerships with community organizations, technology companies and local business leaders. Support them with a series of manuals and study guides that encourage their contribution of real world solutions. Such a mentoring program would leverage existing social networks to drive education and productive discussions of technology and business.

Creating a portal for MBEs to visit could address this recommendation. In addition, it could demonstrate many of the technologies that the MBDA would be advocating. In effect, "walk-the-walk".

For example, the portal can provide the following capabilities from Web 2.0:
- A Wiki that allows users to add, remove, or change content;
- A social networking capability to allow MBEs to share information regarding technology;
- Blogs – which could continue to assist in mentoring – possibly have an author write a frequent article addressing MBEs and technology;
- RSS feeds – from the leading technology firms and websites – several are listed in Appendix A;
- Webcasts can provide content in a packaged form – and extend instructor-led training options to "on-demand" – when the MBE desires to learn about a specific topic, it can request the information. This would be an extension to the seminars that the Task Force would be conducting in several cities across the country – the content from these seminars could be collected and available for access through the portal.

- *Drive deeper connections between technology and existing economic development opportunities.*

Provide a several different facilities to have technology corporations to reach the MBE:
- One approach could be a web-site based "Solution Provider Locator" – rather than provide a link to a similar resource such as http://crn.com/cwb/tools/splocator.jhtml, create a specific locator that is targeted for MBEs – this provides several values – offerings may be viewed with more value if the offerings have more appropriateness to the MBEs and it provides a "carrot" to technology firms to reach more firms.
- Another approach is developing partnerships with corporations that can provide services to assist the MBE. An example of a model that the MBDA could adopt is similar to a web-site http://www.buyerzone.com/ that functions as a conduit between the small business (or MBE) and vendors based upon a number of different goods and services.   An alternative that the MBDA could explore is to work with technology vendors to provide discounted, volume pricing so that technology could be more affordable and easier to obtain – a resource that performs similar activities is the Small Business Technology Network – www.smbtn.org – the provide volume price discounts from several vendors

For the MBE

If you've read this far, you have an interest in using technology to support your business. If this paper has helped you, then there are several next steps that you can use.

You'll need to procure technology – or you may want to use a consultant to work with you to develop a strategic plan to use technology – this is a an approach that can assist you to compare your organization to peer organizations and provide you with a set of technological initiatives.

- Develop a list of business functions you wish to use technology for (i.e., accounting, human resources, etc.).
- Determing a budget to spend on technology – for purchase and ongoing support.
- Prioritize your initiatives.
- Procure expert advice.
- Use information in the public domain.
- Procure and use the technology.
- Develop and implement ongoing training in your business.

There are a vast group of resources available to the MBE. For example, the Small and Medium Business Technology Network (www.smbtn.org) provides consultative services as well as volume purchase capabilities. Diversity Business (www.diversitybusiness.com) provides resources and solutions that can assist the MBE. The MBDA is in the process of developing a tookit that will soon be launched – this portal has the eventual goal to provide significant value to the MBE.

Technology in and of itself is not a panacea for improving the performance and productivity of your firm. How you use technology in the course of your business will demonstrative the productivity improvements.

Appendix

Appendix A –References

Publicly available:

For research on current and emerging trends in technology; to explain technologies:
CIO www.cio.com
CRN www.crn.com
CRN's tool to locate technology firms: http://www.crn.com/cwb/tools/splocator.jhtml
Infoweek www.infoweek.com

Capterra www.capterra.com - exhaustive list of packaged software, some advertiser support
Software as a Service Total Cost of Ownership, by www.nwc.com/go/0305f1.jhtml

Small Business Technology Network www.smbtn.org – resources for the small business – including mentoring and technology resources

Diversity Business www.diversitybusiness.com – resources for the minority business enterprise – including mentoring resources

For unbiased research and vendor analysis

Technology Evaluation Centers http://www.technologyevaluation.com/
Software Magazine www.softwaremag.com
To obtain quotes for goods and/or services Buyer Zone: http://www.buyerzone.com/

Vendor Driven

Virtualization Total Cost of Ownership, by VMWare http://www.vmware.com/products/vi/calculator.html?

For a Fee

There are quite a few research firms that will provide, for a fee, industry and technology-specific research. Some of the leading firms are:
- The Gartner Group
- Forrester Research
- DataQuest
- IDC
- Yankee Group
- Ferris Research

Appendix B - Software 500 [38]

The following is the top 50 of the Software Magazine's Top 500 software manufacturers – based upon Software/Services Revenue.

Rank Up Dn	Company U.S./World Headquarters Sort Up Sort Down	Web Site	Software / Services Revenue ($Million)	Software / Services Revenue Growth	Corporate Revenue ($Million)	Corporate Revenue Growth	Services as %	R&D as % of Corporate Revenue	Employees	Software Business Sector
1	**IBM**		$63,110.00	3.0%	$91,134.00	-5.0%	75.0%	6.0%	366,345	Middleware/Application Server/Web Server
	Armonk, NY	www.ibm.com								
2	**Microsoft**		$36,546.00	8.0%	$39,788.00	8.0%	NA	16.0%	61,000	Operating Systems
	Redmond, WA	www.microsoft.com								
3	**EDS**		$19,757.00	-4.0%	$19,757.00	-4.0%	NA	NA	117,000	Outsourcing Services
	Plano, TX	www.eds.com								
4	**Hewlett Packard**		$17,380.00	26.0%	$86,696.00	8.0%	NA	4.0%	150,000	System Integration Services/IT Consulting
	Palo Alto, CA	www.hp.com								
5	**Accenture**		$17,094.40	13.0%	$17,094.40	25.0%	NA	NA	123,000	Operating Systems
	New York, NY	www.accenture.com								
6	**Computer Sciences Corporation**		$14,058.60	-7.0%	$14,058.60	-7.0%	NA	NA	79,000	System Integration Services/IT Consulting
	El Segundo, CA	www.csc.com								
7	**Oracle Corporation**		$11,799.00	16.0%	$11,799.00	16.0%	20.0%	13.0%	49,872	Database
	Redwood City, CA	www.oracle.com								

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[38] Software Top 500, SoftwareMag.com

8	**SAP**		$9,994.40	7.0%	$10,080.40	8.0%	67.0%	13.0%	32,205	Enterprise Resource Planning(ERP)
	Newtown Square, PA	www.sap.com							
9	**Hitachi**		$9,023.10	-5.0%	$80,896.00	-4.0%	85.0%	4.0%	35,600	Middleware/Application Server/Web Server
	Brisbane, CA	www.hitachi.com							
10	**Capgemini Pvt**		$8,885.90	4.0%	$8,885.90	4.0%	NA	NA		System Integration Services/IT Consulting
	New York, NY	www.capgmini.com							
11	**Lockheed Martin**		$8,141.00	6.0%	$37,213.00	5.0%	NA	NA	135,000	System Integration Services/IT Consulting
	Bethesda,, MD	www.lockheedmartin.com							
12	**NTT Data Corporation**		$7,982.70	0.0%	$7,982.70	0.0%	NA	NA	7,620	Telecommunication Services
	New York, NY	www.nttdata.co.jp							
13	**QUALCOMM**		$5,673.00	16.0%	$5,673.00	16.0%	66.0%	18.0%	9,300	Wireless/Mobile
	San Diego, CA	www.qualcomm.com							
14	**SYNNEX Corporation**		$5,640.80	6.0%	$5,640.80	6.0%	NA	NA	2,026	Supply Chain/Manufacturing
	Fremont, CA	www.synnex.com							
15	**EMC Corporation**		$5,177.10	19.0%	$9,664.00	17.0%	51.0%	10.0%	26,500	Storage Management
	Hopkinton, MA	www.emc.com							
16	**Affiliated Computer Services, Inc.**		$5,000.00	22.0%	$5,000.00	22.0%	100.%	NA	55,000	Outsourcing Services
	Dallas, TX	www.acs-inc.com							
17	**Avaya, Inc.**		$4,902.00	20.0%	$4,902.00	20.0%	NA	8.0%	19,100	Telecommunication Services
	Basking Ridge, NJ	www.avaya.com							

18	**Unisys Corporation**	$4,788.50	1.0%	$5,758.70	-1.0%	NA	NA	36,100	System Integration Services/IT Consulting
	Blue Bell, PA	www.unisys.com							
19	**Fiserv, Inc.**	$4,059.50	9.0%	$4,059.50	9.0%	NA	NA	22,000	Financial Applications
	Brookfield, WI	www.fiserv.com							
20	**SunGard Data Systems, Inc. Pvt**	$4,002.00	13.0%	$4,002.00	13.0%	NA	NA		Financial Applications
	Wayne, PA	www.sungard.com							
21	**Sun Microsystems, Inc.**	$3,944.00	3.0%	$11,070.00	-1.0%	NA	NA	38,802	Middleware/Application Server/Web Server
	Santa Clara, CA	www.sun.com							
22	**LogicaCMG**	$3,428.70	7.0%	$3,428.70	7.0%	NA	NA		System Integration Services/IT Consulting
	Lexington, MA	www.logicacmg.com							
23	**Computer Associates International, Inc.**	$3,426.00	5.0%	$3,530.00	8.0%	29.0%	NA	15,300	Infrastructure/Network Management
	Islandia, NY	www.ca.com							
24	**Getronics**	$3,320.10	2.0%	$3,320.10	2.0%	NA	NA	25,266	Enterprise Application Integration
	Billerica, MA	www.getronics.com							
25	**Symantec Corporation**	$2,582.80	38.0%	$2,582.80	38.0%	NA	13.0%	15,500	Security Tools/Systems
	Cupertino, CA	www.symantec.com							
26	**Convergys Corporation**	$2,582.10	4.0%	$2,582.10	4.0%	NA	NA	66,300	Financial Applications
	Cincinnati, OH	www.convergys.com							
27	**DST Systems**	$2,500.00	3.0%	$2,500.00	3.0%	NA	NA	9,500	Financial Applications
	Kansas City, MO	www.dstsystems.com							
28	**Wipro Limited**	$2,185.30	117.%	$2,385.50	77.0%	NA	NA	46,500	System Integration

	Mountain View, CA	www.wipro.com							Services/IT Consulting
29	**Juniper Networks, Inc.**		$2,064.00	54.0%	$2,064.00	54.0%	14.0%	17.0%	4,145	Infrastructure/Network Management
	Sunnyvale, CA	www.juniper.net							
30	**Amdocs**		$2,038.60	15.0%	$2,038.60	15.0%	95.0%	7.0%	13,000	Telecommunication Services
	St. Louis, MO	www.amdocs.com							
31	**Perot Systems**		$1,998.30	13.0%	$1,998.30	13.0%	NA	NA	13,500	System Integration Services/IT Consulting
	Plano, TX	www.perotsystems.com							
32	**Intuit, Inc.**		$1,966.70	13.0%	$2,037.70	13.0%	37.0%	15.0%	7,000	Financial Applications
	Mountain View, CA	www.intuit.com							
33	**Adobe Systems, Inc.**		$1,966.30	18.0%	$1,966.30	18.0%	2.0%	19.0%	5,480	Office Productivity Tools
	San Jose, CA	www.adobe.com							
34	**Level 3 Communications**		$1,894.00	2.0%	$3,613.00	-1.0%	NA	NA	4,800	Telecommunication Services
	Broomfield, CO	www.level3.com							
35	**SAS Pvt**		$1,680.00	10.0%	$1,680.00	10.0%	9.0%	24.0%	10,180	Business Intelligence/Analytics
	Cary, NC	www.sas.com							
36	**VeriSign, Inc.**		$1,661.00	43.0%	$1,661.00	43.0%	NA	NA	4,076	Messaging/Communications
	Mountial view, CA	www.verisign.com							
37	**Misys plc**		$1,619.40	2.0%	$1,619.40	-2.0%	NA	NA	6,507	Financial Applications
	Raleigh, NC	www.misys.com							
38	**Infosys Technologies Limited**		$1,592.00	50.0%	$1,592.00	50.0%	NA	NA	36,800	System Integration Services/IT Consulting
	Fremont, CA	www.infosys.com							

39	**Autodesk, Inc.**	$1,523.20	23.0%	$1,523.20	23.0%	18.0%	20.0%	4,813	Engineering
	San Rafael, CA	www.autodesk.com							
40	**Anteon International Corporation**	$1,493.20	18.0%	$1,493.20	18.0%	NA	NA	9,500	System Integration Services/IT Consulting
	Fairfax, VA	www.anteon.com							
41	**BMC Software**	$1,463.00	3.0%	$1,463.00	3.0%	63.0%	18.0%	6,000	Storage Management
	Houston, TX	www.bmc.com							
42	**The Sage Group plc**	$1,368.80	11.0%	$1,368.80	11.0%	NA	NA	8,686	Financial Applications
	Irvine, CA	www.sage.com							
43	**Emdeon Corporation**	$1,276.90	10.0%	$1,276.90	10.0%	NA	NA	6,100	Healthcare
	Elmwood Park, NJ	www.emdeon.com							
44	**Compuware Corporation**	$1,231.80	-3.0%	$1,231.80	-3.0%	75.0%	NA	7,908	Lifecycle Management
	Detroit, MI	www.compuware.com							
45	**Acxiom Corporation**	$1,223.00	21.0%	$1,223.00	21.0%	NA	NA	6,500	Customer Relationship Management
	Little Rock, AR	www.acxiom.com							
46	**BEA Systems, Inc.**	$1,200.00	19.0%	$1,200.00	19.0%	57.0%	14.0%	3,878	Middleware/Application Server/Web Server
	San Jose, CA	www.bea.com							
47	**Novell, Inc.**	$1,197.70	3.0%	$1,197.70	3.0%	28.0%	17.0%	5,200	Infrastructure/Network Management
	Waltham, MA	www.novell.com							
48	**Dassault Systems**	$1,184.10	10.0%	$1,184.10	20.0%	16.0%	26.0%	5,693	Application Development/Testing/Lifecycle Tools
	Woodland Hills, CA	www.3ds.com							
49	**UGS Corporation Pvt**	$1,154.60	18.0%	$1,154.60	18.0%	69.0%	15.0%	6,200	Engineering
	Plano, TX	www.ugs.com							

50	**Harte-Hanks**	$1,135.00	10.0%	$1,135.00	10.0%	NA	NA	7,106	Customer Relationship Management
	San Antonio, TX	www.harte-hanks.com							